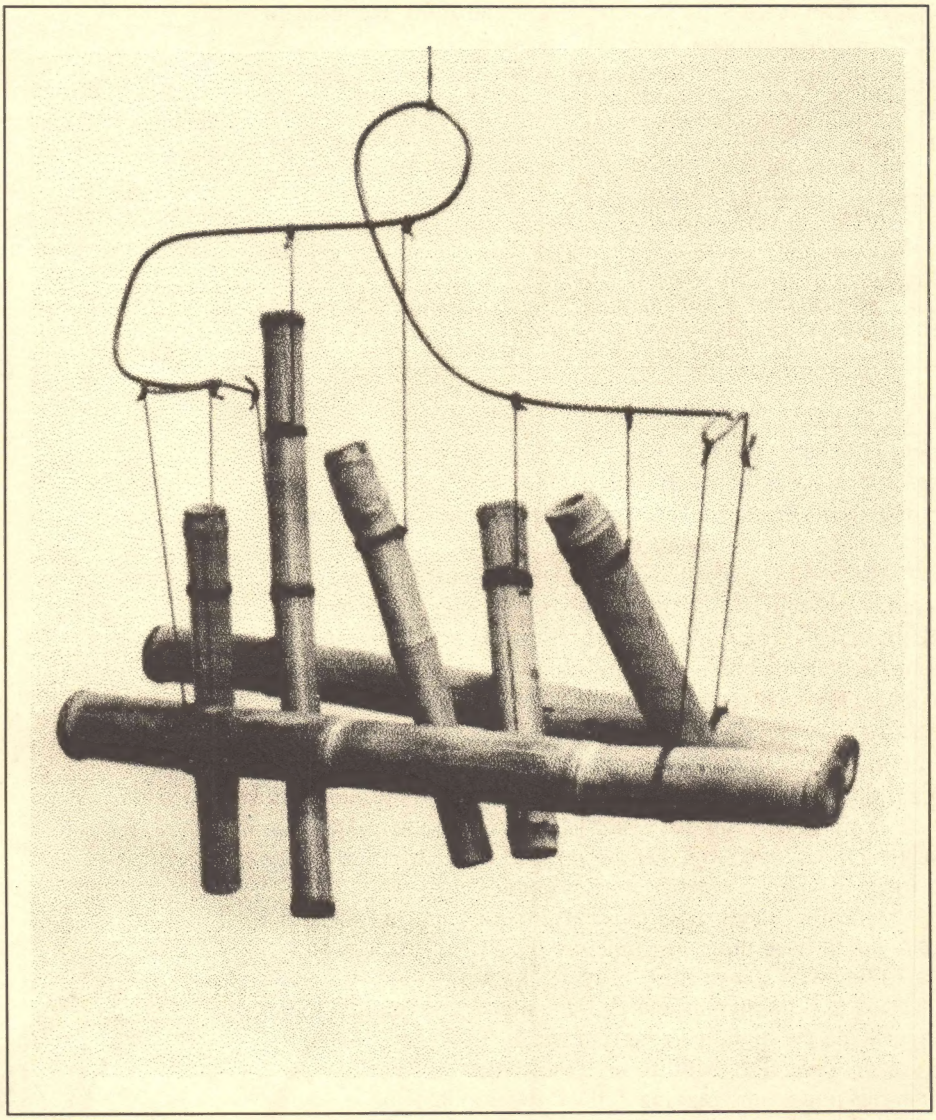
VOLUME 11 #1 SEPTEMBER 1995 PRICE $6

EXPERIMENTAL MUSICAL INSTRUMENTS

For the Design, Construction, and Enjoyment of Unusual Musical Sound-Makers

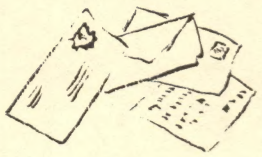
NINJA TURTLES AND MELTED RADIOS

Among the sound-making toys you can pick up at *Toys R Us* or *KMart*, the majority produce their sounds through inexpensive internal electronic sound chips and tiny speakers. Yet you can still find purely acoustic sound-toys here and there along the toy store aisle. And the sound-making tricks in some of them are awfully clever. In this issue of *EMI* you can get a look at a few of them. Also in this issue are articles on glass harmonica, mechanized rasp instruments, mock-historical oddities, nature sound recordings, and much more. So open up, and read.



Above: Wind-sounded bamboo flute chimes. See the article starting on page 29.

TENTH ANNIVERSARY ISSUE !



IN YOUR LATEST ISSUE, Letter writer Richard Waters referenced the film: "The Theremin". The film was shown at the San Francisco Film Festival in 1993. Steve Martin, the director, etc., was there and gave a very interesting talk after the showing. He also gave a demo on an RCA Theremin owned by the Exploratorium. (Their instrument is, unfortunately, not powered by the original innards. They have substituted a no longer available modern Theremin kit.) I was able to get Mr. Martin's fax # from the festival office and have corresponded with him. He tells me that Orion will be doing a commercial release in the fall. After the release, videos will probably be available. Also, he has a list of Theremin recordings which I hope to get some day.

I am, and will be, sending anything I get to David Shucavage at his WWW site for info on unusual instruments. I found out about your journal there.

Electronic Musician just published plans for an optical Theremin. They indicate plans for a "real" Theremin will be coming soon. Of note, they state that they have had more requests for Theremin plans than any other "kit" project.

RE: strange sounds [discussed in letters to the editor in EMI's last two issues]... do you remember the Sausalito houseboat mystery of a few years ago? Residents heard a loud buzzing sound during certain times of the year. Turned out to be the mating "clicks" of some marine animal.

Will Dahlgren

FROM THE EDITOR: The URL for David Shucavage's world wide web site is HTTP://telerama.lm.com~dshu/folkstuff.html.

I WAS STARTLED AND DELIGHTED to find Cary Clement's article ["Augustus Stroh and the Famous Stroh Violin"] in *Experimental Musical Instruments* Vol 10, No. 4. Thank you to Cary for putting his extensive research into print and making it available. I have a few comments to add.

The Stroh violin is still in use and being made to this very day, primarily in Transylvania, among both Romanian and Hungarian folk musicians. The violinist in my Hungarian folk music band has just acquired a brand new one, made last year. In Hungarian, it is called *tölcseres hegedü* [literally, funnel fiddle]; in Romanian — *vioara cu goarna* [literally, violin with a horn]. The instrument is still in use in Transylvania, particularly in the Bihor region. Its strength lies precisely in the loud, penetrating quality of its tone production, which can be heard above the sound of talking, stamping, foot shuffling, crowd noises, etc., in social dance situations lacking an amplification system.

A typical Transylvanian musical grouping that includes this violin would have three instruments: the Stroh violin, a bowed bass (often with gut strings), and a "kontra" (violin or viola converted to play rhythm and chords only, by having its bridge flattened and the highest string removed).

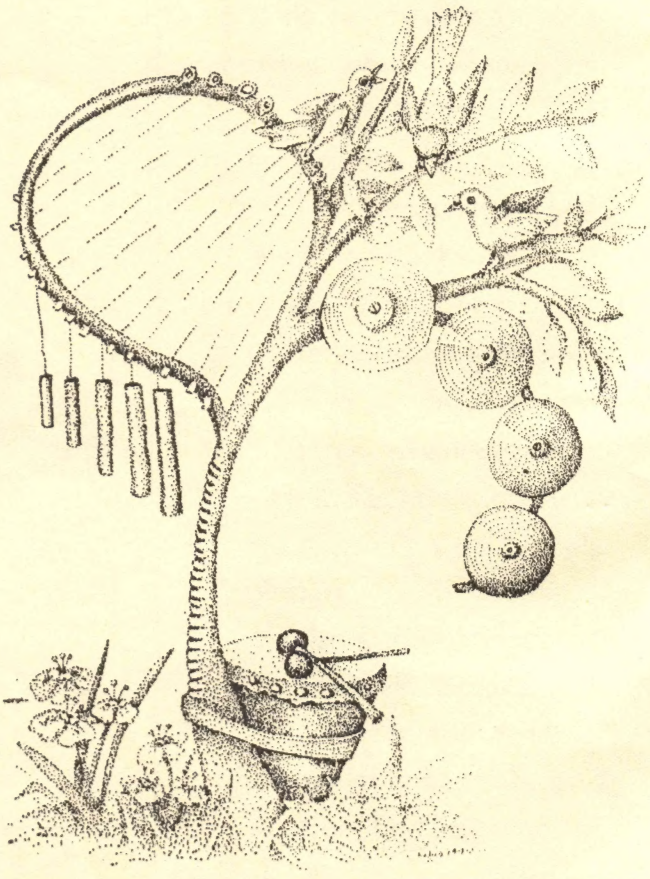
I have several (studio-made) recordings of Romanian and Hungarian musicians playing folk music for dancing on Stroh violins, with various accompanying configurations.

In its Hungarian version, the Stroh violin has a very simple mechanical arrangement, in that one leg of the bridge rests on the diaphragm of what looks like an automobile horn. The conical "speaker" or sound-projecting horn is either tin or tinned steel, being forced into the central hole of the automobile horn part and held there partly by friction, partly by liberal use of beeswax. The fingerboard, tuning pegs, and length of the instrument are pretty much standard (comparable to a student-model violin). The instrument lacks, of course, a resonating chamber and body.

Craig Packard

I'M JUST ABOUT TO GET ON A PLANE to Europe for a two-week concert trip but wanted to get a quick note to you about the Stroh article. You can imagine my surprise to find such a well written and thoroughly researched effort when I tell you I've been involved with phonoinstruments for about twelve years. I've acquired both a Stroh-style phonoviolin, made by a licensee in Germany, and a Stroh phonofiddle. In the process I even came across a Jewsaphone (according to Huey P. Long as quoted on the box: "Properly played, the Jews Harp expresses the deepest feelings of the human soul") for which I've enclosed a couple of photos.

I acquired my phonoviolin to be used in concerts that I perform under my series of "Echoes of Forgotten Instruments" programs. The phonoviolin and theremin are used together in my program



Drawing by Robin Goodfellow

"Rare Instruments from the Early 20th Century" that was premiered at the Teatro 'Il Sistina' in Rome for a live simulcast radio and TV concert over Italcable on February 26th this year. The phonoviolinist, Tim Kraus from Berkeley, and I will be repeating the program in LA at the Bing Theatre in the Los Angeles County Museum of Art on Sunday afternoon, August 6 for a "Sundays at Four" radio simulcast concert. I've enclosed a copy of the program plus a B&W photo of the two of us (I am pictured at my new custom-designed Moog concert theremin).

I'm also using the phonoviolin these days to achieve an authentic silent film ensemble sound texture. It will be included (together with piano, cello, theremin, ondes martenot and Baschet cristal) in a new score I've created for the 1924 Soviet science fiction saga *Aelita, Queen of Mars*. The phonoviolin will be played by L.A. musician Amy Crocker in two upcoming premier performances on June 10 and 11 at the Louvre Museum in Paris as part of the 10th anniversary celebration of the Louvre's performance auditorium.

Upcoming will be another one of my new silent film scores using the phonoviolin — this one to premier in January, 1996 at the Pacific Film Archive in Berkeley. The film is titled *House on Tubnaya Square* and was made in the Soviet Union in 1928.

Dennis James

ABOVE: Dennis James at the theremin and Tim Kraus with the phonoviolin.

Left: A trump with a sound radiator horn, called "Jewsaphone" by the manufacturer, from Dennis James' collection.

IN THIS ISSUE

EXPERIMENTAL MUSICAL INSTRUMENTS
For the Design, Construction and Enjoyment of Unusual Musical Sound Makers

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REGARDING MIKE HOVANCSEK'S LITTLE ARTICLE on Tim Buckett's ideas for speed bump music ["Speed Bump Music (the Work of Tim Bucket)" in *EMI* Volume 10 #4, June 1995], I believe an example of this already exists. I can only remember some of the specifics, though, and I would love to learn more.

In Spring 1994, I was performing in Bologna, Italy. At a dinner party there, I met the wife of an unusual architect, whose name I now forget. She was discussing his newest project, an adult theme park in Barcelona, Spain, called "Real World", a joint venture of pop iconoclasts Peter Gabriel, Brian Eno, and Laurie Anderson. Apparently this architect had won the commission on the basis of a successful project he had completed with Peter Gabriel a few years prior, a musical bridge built somewhere in the Midwest, crossing one of the large rivers. The bridge plays the melody of one of Gabriel's songs as cars drive across it, using a textured roadbed as described in Mike's article. Perhaps this bridge is in Ohio? I wish I could remember the details.

Has anyone else heard of this?

Thanks, as always, for publishing one of the most stimulating magazines around!

Robert Rich,
Soundscape Productions, Amoeba Music,
1071 Main Street, Suite #1, Cambria, CA 93428

I GOT A KICK out of the ideas presented in Hovancsek/Bucket's "Speed Bump Music". The article brought to mind an idea I'd had for 'tone roads' — sections of highway with grooves strategically spaced so that the occupants of a moving vehicle would hear a few bars of a geographically correct song (e.g. "Oklahoma!", "I Love L.A.", "I Love New York", etc.). Although the front and back wheels on either side would play the same pitch sequence (a split second apart), there is no reason the sounds from the right and left wheels have to be the same. A melody on the left could be accompanied by a bass line or counter-melody on the right.

In the creation of such a roadway, the effect of the back wheels' "echo" should be taken into consideration when laying out a groove pattern. Slow moving legato passages might need no modification, but if a melody moves along at a pretty good clip, separating each grooved area with approximately 7'-9' of smooth road would suffice to clarify the melodic line. On the other hand, the back wheel "echo" could be used in a strict canon in which two melodic lines are one beat apart.

Dynamics could be controlled by the size and/or shape of the grooves. A vibrato of sorts could even be achieved by either varying the spacing (lyric vibrato) or size (amplitude vibrato) of the grooves. I tend to think in terms of grooves rather than bumps because it seems the musical pitch would be clearer, particularly for lower pitches. To illustrate:

Say you want to produce a pitch of A-220 at a speed of 60 mph. This speed is equivalent to 88 feet per second, so you would need 220 bumps or grooves per 88 feet, or one every 4.8 inches. Picture a tire rolling over the bump version. The tire would not only impact on the bump, but also on the road as it rolled off the bump. This seems like it would cause the resulting pitch to be somewhat noisy, although at increasingly higher pitches this would be less of a problem. As the bumps got closer together, the bump-surface pattern would increasingly resemble a surface-groove pattern — at least from the tire's point of view.

If the bump version were found to be workable, it might simplify the creation of such musical roads. At expressway speeds, only a minimal bump height might needed to create plainly audible tones. (This is suggested by the existence of speed bumps which appear to be painted onto the road.) Perhaps the musical material could simply be painted on.

Michael Meadows

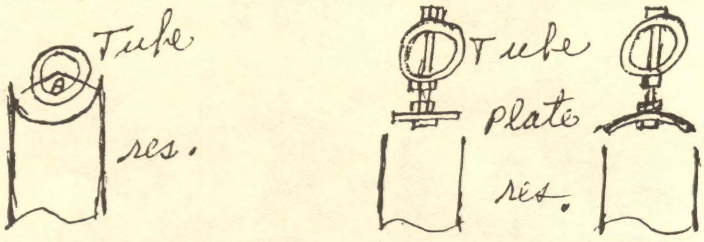
From the editor: The speed-bumps/grooved-roadway idea is also related to other mechanisms in which sound is generated when something bumps over a ridged surface. Two examples of such programmed sound-bumps, on a much smaller scale than roadway bumps, appear in this issue. One is a mechanical speech-reproduction device employed in a Teenage Mutant Ninja Turtle toy, and a similar trick used in a novelty greeting card, described in the article on sound-making children's toys. The other is the rotary rasp described in this issue's *Ramblings* column.

IN THE ARTICLE ON TUBULONGS in the Dec. '94 issue, Bart Hopkin states quite accurately that "The round surface of a tube doesn't drive the air in the resonator as efficiently as the flat undersurface of a marimba bar."

But there are ways around this. The more of the pressure wave generated by a tube you can funnel into a resonator, the harder the tube will drive it.

The simplest way is to use resonators whose right and left upper edges subtend the widest possible angle to the longitudinal axis of the tube [as in the drawing on the left below].

Another is to bolt through the tube a flat or slightly concave plate that more effectively drives the air [as in the two drawings on the right].



The concave plate has the virtue of "focusing" the pressure wave (when correctly curved) at the flat stopper of the resonator, where it is reflected back more intensely than is an "unfocused" pressure wave. Another advantage of the bolted "pressure plate" is that it slows the vibratory rate of the tube, resulting in shorter tubes for lower pitches.

Some interesting effects may also be possible with bent tubes. I have built "bent" metal bars and a "bent" bars of wood (whose angled sections are connected by metal joints or side pieces) which behave exactly like straight bars. I've not yet experimented with "bent" (or sectioned, joined) tubes, but someone may want to try it.

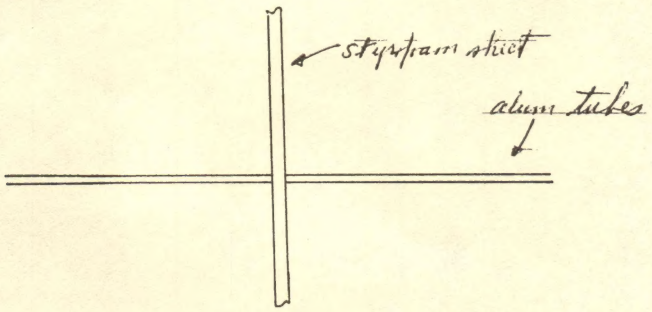
As soon as my home is finished here in the Philippines, I'll set up a workshop where I can pursue these ideas to finished, and I hope much more playable, bar instruments.

By the way, I just figured out today how to compact a 5.5 octave marimba, from F#10 to C-76 into a 4 foot 6 inch playing length. The F#10 bar is 5 inches wide and the C-76 is 1.25 inches wide. Bet you can't figure how, but it will be in the book.

Blake Mitchell

The reference at the end of the preceding letter is to a book on marimba design that letter writer Blake Mitchell has been compiling. Blake adds further comments in these excerpts from a second letter:

...I once built an aluminum tubaphone in the following way. 1/2 inch aluminum tubes (6061 T6 alloy) with 1/16 inch thick walls were clamped at their centers (midlengths) through a sheet of 1/2 inch thick styrofoam as a soundboard. In section it looked like this:



I don't know what the top and bottom pitches were, as I did not then own a tuner and did it by ear.

In this case the "clamping" mechanism was an undersized hole burned into the foam sheet, then the tubes push in tightly.

Since you have a tubaphone on two sides of the soundboard, two people can play at once, with four-note chords and rapid repeats of single pitches possible.

I have diagrams of tubaphones laid out in an improved Hammered Dulcimer pattern. It's a fair sized instrument, should be damped like a vibe, but the playing "reach" is quite moderate. One of the advantages of having the tubes run from R to L is that they are far easier to strike accurately. Another of my designs is a tubephone with a wholetone (6-6) keyboard. The tubes are mounted on a large cylinder about 24 inches in diameter and of required length. A foot pedal controls a reversing motor for rotating the desired pitches into playing position.

With a stepped, double, two layered keyboard (actually 2 keyboards pitched 1.5 octaves apart), three octave jumps and chords are available without rotation, so little rotation would be needed, far less than with the single keyboard design. These designs should have a damping system too.

If there is opportunity I will throw some of these into the "fantasy" chapter of the book. They would be things almost anyone could build and are microtonally practical as well.

As time permits here [at the letter writer's new home in the Philippines], I will be making sample bars of various woods I encounter, to find a workable substitute for rosewood. I can already make bi-material bars that have rosewood sound. It's simply a matter of putting the correct harmonics at the proper dynamic levels. Del Roper and Lowell Montz did it years ago, and some marimba makers today are using plastics that give identical sound to that of rosewood.

Musser's "Kelon" bars are in fact, to my ear, an improvement over rosewood. I would buy Kelon *over* rosewood. So perhaps I'm not 100% backward after all.

Our small house is finished now and we are in it. After a month vacation from our efforts, we'll begin work on the main house again. Then comes the workshop and a whole raft of interesting projects.

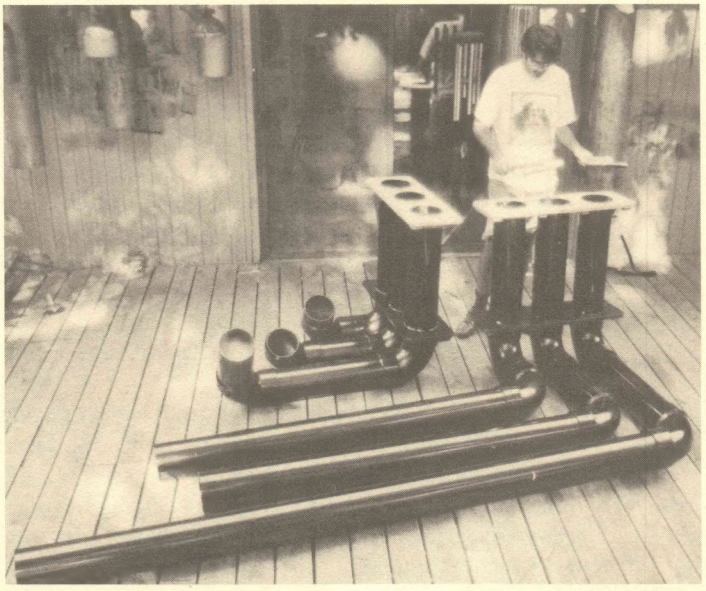
I'll be 73 soon, but in this lovely, peaceful, stress-free place, I might just live forever! I no longer have any sense of the urgency of time.

Blake Mitchell

REMEMBER P.V.C.LAWN FURNITURE? I thought so. Here's the latest (and greatest) instrument to come out of the Earthshaking Percussion workshops. I call it a Magnum Tube-A-Tone. This instrument was designed and built for the Santa Clara Vanguard Drum and Bugle Corps and will be played on tour around the country during the '95 season. The instrument is made from 6"diameter tubing (cell-core for weight saving) and red oak for the mounts. This Tube-A-Tone is tuned to D G A d g a, with the lowest D falling on the innermost ring of my Strobetuner. The open ends of the tubes are played with the foam padded paddles shown in the photo. The sound of this instrument is fairly loud, with good sustain on the low tubes especially. The high octave has a little less sustain but has a very percussive, tuned BONG sound.

...Thanks again for putting out such a great journal. I look forward to every issue.

David Strohauer,
Earthshaking Percussion



Earthshaking Percussion's *Magnum Tube-A-Tone*

NOTES FROM HERE AND THERE

MARK WHITECAGE makes sculptures. Mark Whitecage also makes music from those sculptures. He sent along these photos [next page] of his *crystal*, *12 bolt steel cello* and *bowed horn*, taken by his wife and musical partner, Rozanne Levine. Here are excerpts from information he sent along with the photos.

You could say Mr. Whitecage's pieces are sculptures that make sound, though most people find more picturesque ways of describing these one-of-a-kind creations. As one writer put it, "When you walk into his apartment in Hoboken, it looks like the Martians have landed. His Sound Sculptures look like mini props from a Star Trek episode: the Copper Vibes, the Put Pot, the Crystal, and Aluminum Piano. Whitecage's Sound Sculptures are as interesting to look at as they are to listen to."

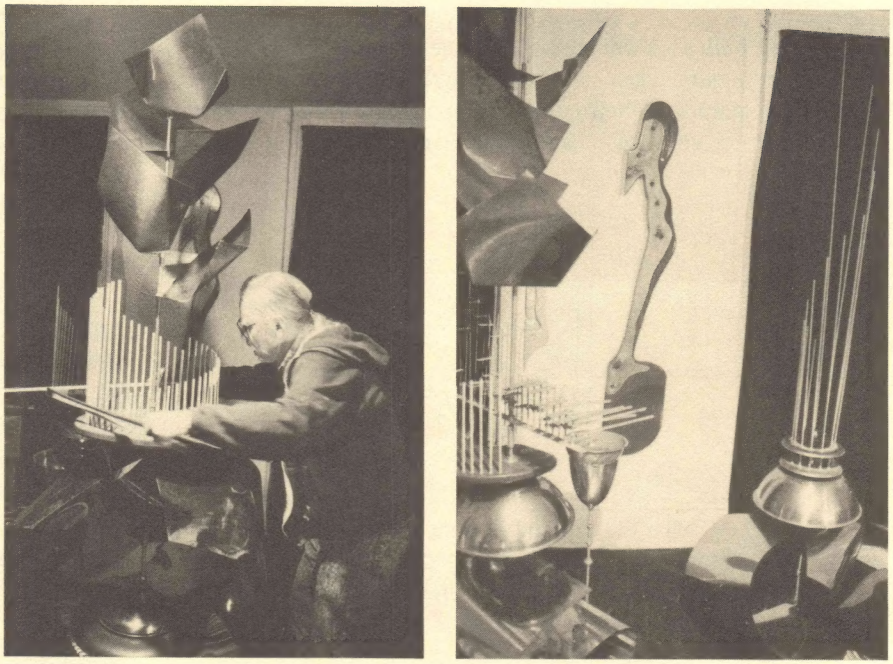
People from Zurich to New York have been looking and

listening. With sheet metal, pine boards, bolts, stainless steel bowls and other shimmering components from various machinery and household wares, Mark transmutes everyday objects into beautiful sculptures that sound. They stand alone, uniquely themselves, adding the dimension of music when struck with a mallet or stroked by hand or bow.

In the late 1970s, Mark had the opportunity to play sound sculptures designed by Frenchmen Bernard and François Baschet. Intrigued with the possibility of making sounds he had never heard before, Whitecage was inspired to design, play and record his own "singing sculptures."

Currently Mr. Whitecage incorporates the sculptures in performance with his musical group, the *Glass House Ensemble*. The Ensemble weaves the otherworldly sounds of the sculptures with Mark's alto and soprano saxes and alto clarinet, and has included such musicians as Joe Fonda, Rozanne Levine, Perry Robinson, Gerry Hemingway, and Mario Pavone.

ACOUSTICS (406 Washington St., Hoboken, NJ 07030-4806) recently released the Glass House Ensemble's first cassette, entitled *Watching Paint Dry*, featuring Whitecage, Rozanne Levine, Joe Fonda, Mario Pavone, and Gerry Hemingway. England's *The Wire* magazine said of *Watching Paint Dry*, "It's a set full of nuance and elegance, from (mostly) cool to (occasionally) funky to (rarely) dramatic, never lacking interest, often texturally fascinating."



SOUND SCULPTURES BY MARK WHITECAGE. Left : Mark Whitecage, with two bows, plays the *Bowed Horn*. Right: On the left is the *Crystal*, a relative of the instrument of the same name created by the Brothers Baschet in France;on the right is the *12-bolt Steel Cello*.

Lincoln Center Out-of-Doors celebrates its 25th anniversary during August 1995. Over 100 different performances of music and dance will be offered free to the public . On Sunday, August 13th, the Festival will inaugurate a new mini-series, *Homemade Instrument Day*, dedicated to experimental acoustic instruments. During this day, visitors to Lincoln Center Out-of-Doors will have the chance to experience workshops, installations and performances by inventors in many modes — from the experimental to the traditional folk instrument. The day, with an expected audience of over 10,000, was curated by sound artist Brenda Hutchinson.

Installations for the day, which begins around 2 pm, include: Blowtorch-activated large-scale pipe/flute, water sculpture, and twelve foot log slit-drum by Charlie and Martha Bremer; a sonic miniature golf installation by Bill and Mary Buchen; Mineko Grimmer's ice-activated marimba; Brenda Hutchinson's giant interactive music box; and Yoshi Wada's trash can. Chuck Wood will provide an interactive rain machine as well as performing with a sand block quartet.

Visitors will be able to participate in workshop/performances with Diana Burgoyne and her fruit-powered mask instrument, Darrel DeVore and his bullroarers, and Leslie Ross and her body-bellows. Other workshops include a balloon orchestra with Judy Dunaway, and ocarinas with Susan Rawcliffe. Both Jackie Rago and Skip La Plante will conduct instrument-making workshops, using primarily household objects and recycled materials.

On the main plaza of Lincoln Center, a jam of homemade instruments will continue throughout the day, featuring Ken Butler (also an advisor with the project), Brad Reed, Zusaan Kali Fasteau and Kevin Hylton, and Zeena Perkins and Eliot Sharpe

Homemade Instrument Day will also feature an international photo installation of instruments and their inventors.

Artists in the day are coming to New York from as far away as California and Vancouver, Canada, and as close as 14th street.

The final performance of the day will be a commissioned work from spatial composer Henry Brant, titled "Dormant Crators" and featuring Pulse Percussion Ensemble, Panama Francis, Pheeroan Aklaff, Gamelan Son of Lion, Pandemonium Steel Pan Orchestra, and 12 timpani.

Lincoln Center Out-of-Doors is sponsored by the Lewis B. and Dororthy Culman Foundation with additional support from foundations, public funding and individuals.

BULLETIN OF PRIMITIVE TECHNOLOGY, in its current issue, has a special focus on primitive musical instruments and sound makers, with several articles devoted to construction information and cultural context for instruments to be made without recourse to modern technology. See the blurb in the "Recent Articles" section at the end of this issue for descriptions of the articles and where-to-get details.

DID YOU NOTICE? This issue of *Experimental Musical Instruments* has a new look to its cover, and to a lesser extent in its innards. This change comes in part because we got some new layout software, and in part to mark our entering a new decade. (*EMI* is now ten years old!) While the final version of the cover design was generated in-house, several people were instrumental in providing impetus, generating ideas, and reviewing various options. In particular, *EMI* thanks Alex Soreff of New York City, as many central elements of the new layout have their basis in his designs and suggestions.

WE CAN TAKE CHARGE CARDS! *EMI* has finally managed to set up a merchant's charge card account, meaning that you can now pay for your subscriptions and other orders through VISA, MasterCard, JCB and a few other credit cards. This will be especially valuable for overseas subscribers with credit cards, allowing them to avoid the inconvenient and expensive currency exchanges that have been an obstacle in the past. To take payment by credit card, *EMI* needs the following information: cardholder's name, credit card number and expiration date, plus the usual order information (what you're ordering, your address, etc.) and a payment total, which is the amount you're authorizing us to charge your card. Forms for credit card payment will be from now on included in all our invoices, renewal notices, etc.

YES! *EMI*'S NEWEST CASSETTE WILL BE AVAILABLE NEXT MONTH!

Not too long after this issue reaches you, *EMI*'s newest cassette tape will become available. *From the Pages of Experimental Musical Instruments, Volume 10* is the latest in an ongoing cassette series presenting the sounds of instruments that have appeared in the magazine. The new one has instruments featured in the four issues of *EMI* Volume 10, dated September 1994 through June 1995. A panoply of instruments are to appear, including: Stroh violin, stone chimes, Apache violin, aeolian harps, fire organs, circuit-bent instruments, tubulongs in several variants, bamboo organ, pot lids, wind chimes, 31-tone guitar, nature sound in both documentary and compositional recordings, performances from an instrument-making workshop, plus possibly one or two more not yet confirmed at the time of this writing.

The Volume 10 cassette is available to subscribers for $8, and to non-subscribers for $10.50. (That includes U.S. airmail and overseas surface rate shipping. Add 20% for overseas air. In California add 7.25% tax.) Of our earlier cassettes, Volumes 6, 7, 8 and 9 are also still available, at the same prices. Checks can be made out to Experimental Musical Instruments at PO Box 784, Nicasio CA 94946, or you can pay by VISA or MasterCard (send cardholder's name, credit card #, expiration date, and total dollar amount for the order). Order now; we'll send the tape around the start of September.

Incidentally, some people have quite reasonably asked why we don't produce CDs rather than cassettes. The answer is that for the small quantities we are producing, CDs are quite a bit more expensive to produce. So, for the time being at least, cassettes it is.

OTHER NEW STUFF AVAILABLE FROM *EMI*: As we move on to Volume 11, the four issues of *Experimental Musical Instruments* Volume 10 will no longer available as individual issues, the original press runs having sold out. Instead, they will be available as a group, photocopied and bound into a single volume set. The issues of the earlier volumes 1 through 9 are available in like form as well. The price per volume set is $17. Order all tenback issue volumes and you'll get our 10% big-order discount (which kicks in on orders over $150), for a total price of $153. We have increased our press run with this issue, so future single issues from Volume 11 and later should remain available for quite some time at $6 apiece.

In the last issue we announced the publication by Lark Books of *Making Simple Musical Instruments*, by *EMI*'s editor, Bart Hopkin. We gave the price of $24.95 but neglected to indicate shipping cost. Those costs are: No charge for surface mail anywhere; add $2 for U.S., Canada or Mexico air mail; add $5 for overseas air. For California orders, include 7.25% sales tax. See the ad in this issue's notices section for a description of the book.

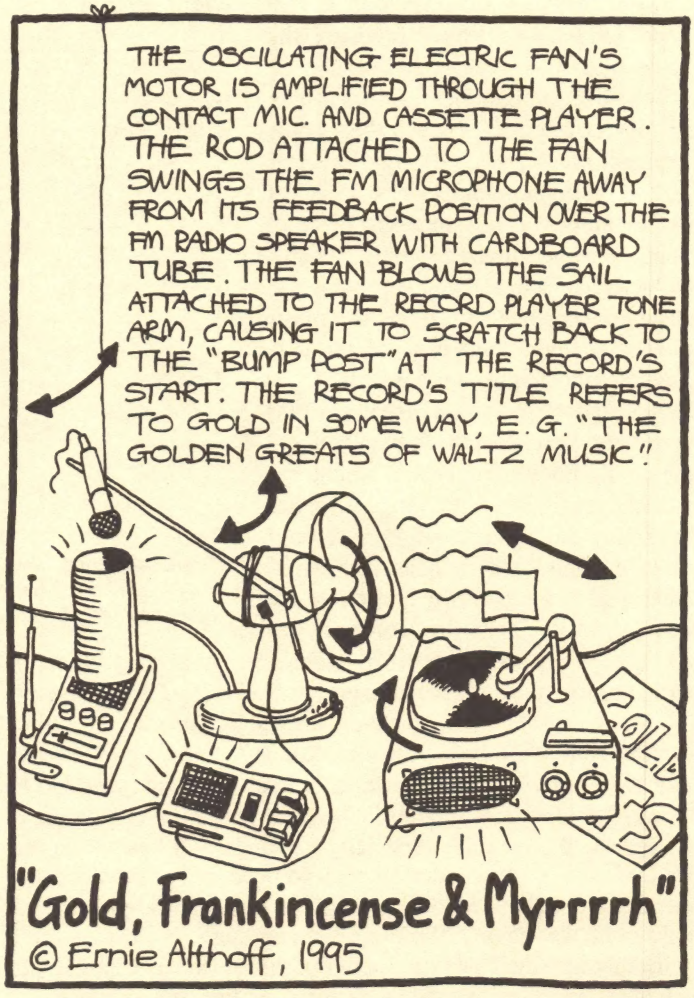
WE'VE UPGRADED OUR COMMUNICATIONS. There's now a proper fax machine in *EMI*'s crowded little office. (Prior to this we had only an internal fax in the computer — an arrangement that has some serious drawbacks.) Our fax number is the same as the voice phone at (415) 662-2182. If the new machine operates as advertised, it will distinguish between your incoming faxes and phone calls.

In addition, we'll now be picking up e-mail at ExpMusInst@aol.com.

CORRECTIONS

In *EMI*'s last issue, in René van Peer's article "Nature on Record, Part 1," there was a list of albums on page 7. The fourth entry in that list should have shown K.C. Halafoff, not Halaloft, as the producer for the Lyrebird recording. A nearby reference in the main text should likewise have read Halafoff, not Halaloft.

On page 6 of the same article, near the end of the first column, a paragraph was inadvertantly truncated. Just above the heading "Demonstration Records", the complete paragraph should have read: "In some cases sound guides are included on soundscape recordings as an index, pointing out the components of the overall image to the listener."



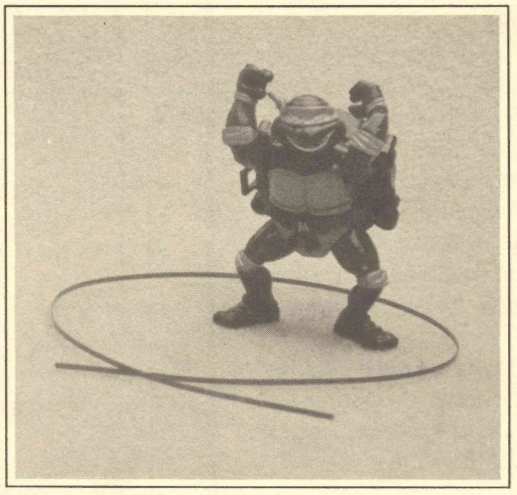
Gold, Francincense & Myrrrh is part of a series of possible sound devices drawn by Australian sound artist Ernie Althoff.

SOUND-MAKING MECHANISMS IN CONTEMPORARY CHILDREN'S TOYS

By Bart Hopkin

For a couple of years, on a sporadic basis, I have been gathering a collection of sound-making children's toys. My reason for wanting to get my hands on these toys was — I needed them to write this article. In this article we'll look at several sorts of sound toys, and see how they make their sounds. The focus will not be on traditional toys, although there are some wonderful sound-making folk toys to be discovered. Rather, the focus of my collecting has been on contemporary plastic type things, such as you would find today at Toys-R-Us, or in the toys section at K-Mart. Learning about these toys' sound-mechanisms will be interesting in itself, and may satisfy some lingering curiosities. Further, some of those mechanisms just might turn out to be useful for people who like to tinker with sound-making ideas. Needless to say, the sound toys discussed in this article are only a sampling, and an arbitrary one at that. Every aficionado of sound gadgetry will have favorites that I have missed.

Many of the commercial sound-making toys now made produce their sound electronically, powered by batteries. Most of the contemporary ones, I suspect, have a microchip and some sort of small, cheapy speaker housed within. Push a button someplace, and you activate a digital sound recording. If the toy is a plastic space gun, the sound may be futuristic shooting or ray-gun sounds. If it's an "action figure" (meaning, usually, a plastic toy version one of those hyper-masculine comic book heroes), the sound may be some pugnacious utterance or other. The sound quality is usually pretty poor, and it's often hard to hear just what's being said. In my own household, attempting to decipher the words of lo-fi talking toys has been a recurring theme. My son insisted that one particular robot toy of his was saying, "Greetings! I am the Atonic Talent Robot!" To grown up ears, with close listening, the words resolved into "Atomic *Powered* Robot." Sometime later we acquired a Spiderman figure which seemed for all the world to be saying, "Spider's ass tingling!" A certain urgency in his tone of voice made the message especially baffling. We listened to that one over and over, wondering what to make of it. Finally, after learning more about Spiderman and his supernatural powers, we realized he was saying "Spider sense tingling!"



Teenage Mutant Ninja Turtle figure manufactured by Playmates Toys. This toy's mechano-acoustic speech system is described later in this article.

But there remains a fair number of purely acoustic sound toys available, and they are the main focus of this article. Some of these incorporate sound-making techniques that have been around fore years and years, continuingly popular because they happen to work well. We'll see several of these in the descriptions that follow. In addition, every so often some clever new sound-making idea comes along, and we'll see a few of those too. I have grouped the toys together according to their sound mechanisms, since many of them represent variations on a few basic types. The categories aren't always clearly delineated, as some overlap, but at least this rough grouping will give us a handle on the material.

I had to destroy some of these toys in order to get at their inner workings. How terrible, to be a destroyer of toys! But it's all in the name of science.

SPRING-AND-DIAPHRAGM TOYS

The primary sound element for a spring-and-membrane toy is a fairly long, soft coil spring. It is loosely stretched between two end points. One or both of these end points is the center of a diaphragm. Typically the diaphragm is nothing more that a small, disk-shaped section of plastic built into the body of the toy. Any vibrations arising in the spring will be conducted to the diaphragm, and radiated from there into the air. The diaphragm also responds to vibrations in the air, and conducts them to the spring, whence they can be fed back to the diaphragm or to another diaphragm at the opposite end. What I have described here is basically an acoustic spring reverb system. It is the nature of springs that they reverberate generously, meaning that vibrations in the spring tend to linger well after the initial driving force has ceased. So: if you shout near the diaphragm, the diaphragm moves in response to the vibration of your shout in the air and conducts the vibration to the spring, with the frequency information of the shout roughly intact. The spring reverberates, sustaining the vibration well after the original shout has ceased. It colors the sound according to its own frequency biases, but still leaves the sound somewhat recognizable. The sustained vibration feeds from the spring back into the diaphragm for radiation back into the air. The result is, you hear a springy-sounding reverberation to your shout. You can also excite the spring directly by plucking or shaking.

I have four toys in my collection using this principle. One is the *Zube Tube*, "The Ultimate Cosmic Sound Machine™," which saw wide distribution a few years ago. In Zube Tubes, the spring is cased in a cardboard tube similar to a mailing tube (but

colorfully decorated). It stretches between two end stoppers very much like plastic disposable drinking cups extending concavely into the tube at each end. Zube Tubes come in various sizes; I managed to get hold of *Zube Tube Jr.*, which is just over two feet long. You can shout in one end and listen back at either end, and it also makes spacey, sproingy sounds when you shake it, causing the spring to bang against the sides of the tube. (Cosmic!). Air resonances within the tube contribute to the character of the sounds as well.

Another fairly popular spring-and-membrane toy is a telephone version. Pardon me, but I don't know the name or manufacturer of this toy. That information does not appear to be printed on the toy itself. I do recall seeing it advertised in a couple of mail order catalogs. The spring is quite long, easily stretching to eight or ten feet, and it is free and exposed — that is, not set inside a casing. (Having such a long exposed spring is fun, but it inevitably leads to disastrous tangles.) At the ends are megaphone-like conical plastic "receivers," stopped at the narrow end by integral plastic disks that serve as the diaphragms. You can put the open end of the receivers to your ear or mouth, telephone-like, and communicate in funny-sounding tones with someone across the room. Or you can send springy sounds to the other person by plucking and shaking the spring. Once again, lots of great, spacey effects.

I have also stumbled across a spring-and-diaphragm microphone toy. It's a plastic thing made to look like a microphone, with a spring inside. You can put on your Elvis costume and sing into it, and your voice will be enhanced with trashy echo. But the microphone toy is smaller than the Zube Tube or the telephone toy just described, with a much shorter spring and just one diaphragm, and the sounds are not impressive.

Finally, there's the Wolf, manufactured by Mattel. This toy was the starting point for Reed Ghazala's extraordinary instrument, the *Sound Dungeon*, described in his article of the same name in *EMI* Volume IX #2 Dec. '93. The Wolf differs from the reverb toys already described in that it has an electronic component. It employs a spring mounted within a foot-long plastic tube. You sing (or whatever) into one end to excite a diaphragm and the spring; at the other end is another diaphragm and either a mic or an electromagnetic pick-up. This is wired to a small battery-driven amp and speaker in a separate plastic casing. The electro-acoustic nature of the thing, coupled with the fact that it easily overdrives the amp and distorts, introduces a new set of effects. Further, you can get very interesting half-controllable feedback sounds by cranking the volume and varying the proximity of the speaker to the tube opening. It likes to make spooky sounds, and the packaging, with the wolf-head shape of the tube opening and a skull picture glued to the amp housing, highlights this. See Reed's article for a wide-ranging and fascinating account..

CLACKER-FLEXERS

In my rather haphazard collecting, I came across just one toy of this type, but my sense is that such things have been around for a long time and are fairly common. Clacker-flexers are devices that produce a quick, sharp sound by flexing a piece of metal in such a way that it abruptly snaps from one position to another. Picture, for example, a small, thin, flexible strip of metal mounted so that it has some curvature to it. Using a simple pivoting mechanism to flex it inward against its curvature will increasingly stress it until, at a certain point, it will snap through to a new rest position of inverted curvature. The snapping through produces a sharp click.

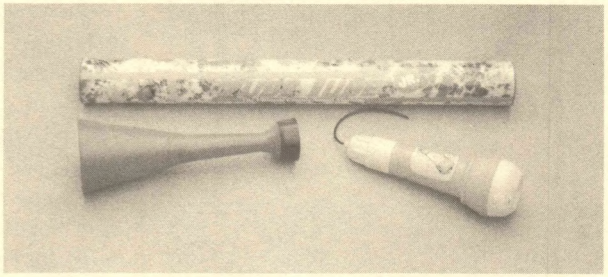
The clacker-flexer I have here is a small, plastic, spherical froggy-looking thing, with protruding eyes atop (see the picture, next page). It actually takes the form of two separate hemispheres hinged together, and when they open apart, the opening resembles a mouth. A metal strip is mounted within, in such a way that it snaps back and forth producing the clacker sound when you open and shut the mouth. It's meant to be cute, and, if you're not too cynical about little plastic throw-away knickknacks, it is.

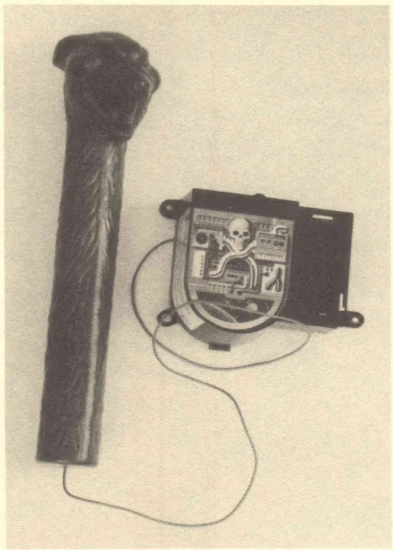
A few more notes on this snapping-through effect: You can get the effect in many ways, in addition to the bent strip just described. A non-toy form that will familiar to most people is the jar lid. Many metal screw-on glass jar tops are made to be sucked into a down position when the jar is sealed air tight, and to pop up to an up position when the seal is broken. After being removed from the jar the lid can be popped back and forth, producing a bit of a popping sound. Some lids work well, producing a nice clear sound, and some work not so well. But you can modify the lids to make unpoppable ones poppable, and to make poorly poppable ones more poppable. The trick is to give the lid just the right amount of curvature in its surface so that it can snap back and forth between concave and convex. One or two or three taps with a ball-peen hammer is usually enough to impart the right amount of curvature to a previously flat lid. But quality control in this operation is difficult, so it's best to start with many lids, and keep only those that produced the best results.

EDGE TONES

Edge tones are the whistling sounds produced when air rushes over an edge, as in flutes and whistles. Lots of toys, both traditional and contemporary, employ edge tones. Here's a sampling from my collection.

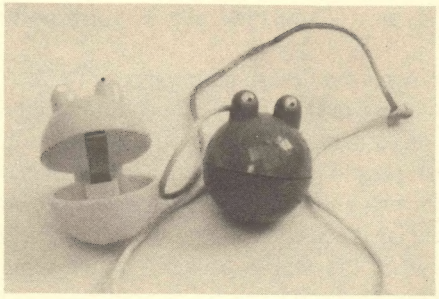
The Nerf Turbo Football (©1989 Parker Brothers) is a small football made of sponge rubber, with two plastic whistles, one on each side. Each whistle consists of a small air chamber, which is imbedded in the foam of the





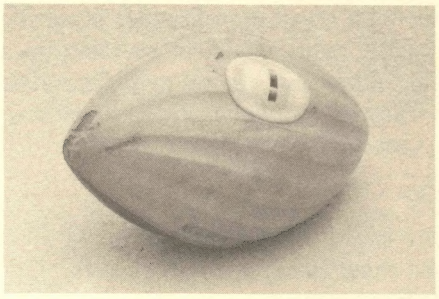
ABOVE:
Zube Tube, toy microphone, and receiver for the spring telephone. The spring for the telephone would normally be attached to the narrow end of the receiver.

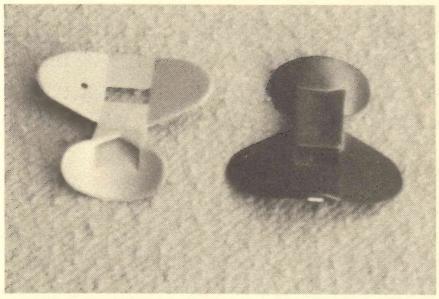
LEFT:
Electro-acoustic echo toy made by Mattel, showing the plastic, wolf-headed spring-housing tube and the amplifier-speaker housing.

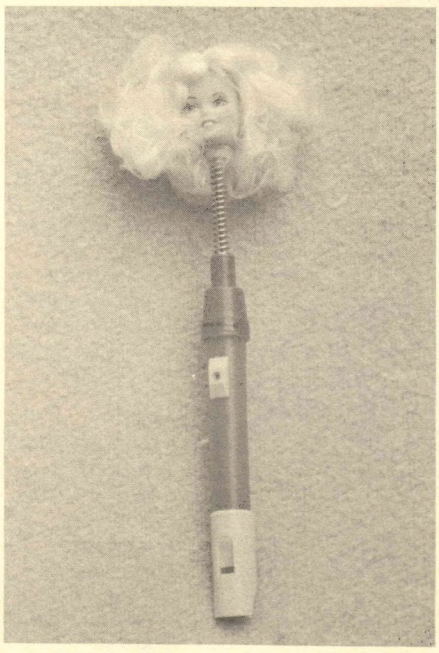


ABOVE: Plastic froggy clacker-flexers

BELOW: Edge-tone toys, including whistling football, Humanatone nose whistles, and spring-mounted illuminated doll's head whistle.







football, with a plastic covering protruding slightly over the surface of the ball. The covering has an opening with a suitable edge formed in it. When you throw the ball, it produces a good, clear whistle as the air rushes over the edge. It's pretty exciting/scary to hear it whistling rapidly toward you when you're making a catch. Note for overseas readers: It's the oblong, pointy American football we're referring to here, not the round ball that Americans would call a soccer ball. The football is thrown in a manner that lets it fly in a certain aerodynamic orientation, allowing properly positioned whistles to sing consistently throughout the flight. I have seen another brand of whistling football, though I don't know who manufactured it, which actually had a missile-like tail attached, ensuring that it would always fly in the correct orientation.

The Humanotone, made by Trophy Music Company, is a small plastic nose whistle. It consists of a single rather small piece of plastic, made to fit over the player's mouth and just below the nose. Exhaling through the nose sends a stream of air through a narrow passageway, past an opening and across a sounding edge located in front of the player's open mouth. The mouth serves as a resonating air cavity, and by changing the size and shape of the mouth opening and the oral cavity, the player can alter the pitch of the whistle. The tone is surprisingly clear, round and warm. Typical range is a little over an octave. It's an amazingly simple, clever little device that really works, although it takes some practice to develop any kind of pitch control. There is, it will be admitted, something a little gross about exhaling forcefully through the nose into a plastic receptacle, for which reason, sharing of Humanotone nose whistles among strangers is not recommended.

Cat-bird whistle: Here's a quirky little item. It's a small plastic slide whistle, with the molded figure of a cat staring into a bird cage sitting atop the body of the whistle. A plastic bird within the cage is mounted on a long-ish tongue of light, springy metal extending horizontally over the body of the whistle, so that with the slightest disturbance it commences to rapidly flutter up and down near the whistle's aperture and sounding edge. A flap of the metal bends down toward the opening in front of the edge, and when the bird flutters downward, the flap blocks the air stream, momentarily stopping the sound. The result is that the whistle tone comes out in a rapid on-off-on-off tremolo (about eight beats/second). Slide whistle tones in rapid tremolo turn out to be a pretty cool effect.

We come now to something I picked up in the dollar bin at a local bargain basement. There's nothing particularly innovative about this toy from an instrument maker's point of view, but it is so bizarre in concept that I just have to include it here. The label on the packaging reads only "Fullchau," accompanied by a drawing of smiling tourists in sunglasses and straw hats with shopping bags in a jungle scene with palm trees, exotic birds and a tiger. The toy consists of a 3/4" x 5" red plastic tube which serves as a battery casing, with a rigid coil spring of about two inches long sticking out the top. Mounted on the end of this spring is a plastic doll's head, with blue eyes and a big glamorous swirl of blonde hair. Electrical wires run through the center of the coil spring up to the head, and when you push a switch on the battery casing tube, the doll's head lights up. On the opposite end of the tube is a separate attached piece with a recorder-like fipple-and-edge arrangement, allowing a one-note whistle. That's all there is to it. What the conceptual connection is between these several components — the doll's head, the light and the whistle — I don't know.

REEDS

Reeds as sound sources are fairly common in toys.

I use the term "reed" in a fairly broad sense here. A reed, for the current purposes, is an air-gating device. It takes a steady stream of air, and, in allowing the air to pass through, rapidly opens and closes the passage so as to break the stream up into a series of pulses. Those pulses, occurring at frequencies in the hearing range, give rise to the sound. As we know from standard musical instruments, reeds can take several different forms. The most common form I have found employed in toys is the sort known as beating reeds. In beating reeds, an opening is covered by a semi-rigid tongue-like piece. At rest position, the tongue is slightly away from the opening, allowing air to pass through. But when air starts to rush through, the air pressure pushes the tongue down over the opening, momentarily shutting it off. The tongue then springs back up, allowing a pulse of air through before it slaps back down again, only to spring up again and repeat the cycle. In what follows, we'll see some examples of beating reeds, plus at least one other reed type.

We can start with a look at an inexpensive bulb horn for a child's bicycle. The one I have here was produced by a company called BikeXtras in York, PA, manufactured in Taiwan. The air for the horn is supplied by a rubber squeeze bulb. The horn itself is molded plastic in a horn shape. The reed is contained in a small, separate plastic encasement made to fit snugly at the base of the horn (visible when the bulb is removed). As shown in the drawing, this particular one happens to be a two-sided reed — two reeds in one, really — which sounds, at slightly different pitches, for both directions of air flow. The tongue is a lightweight, very flexible piece of plastic, and the passageway through which the air must flow is a trough of metal, covered by the tongue. It's wonderful how simple the arrangement is, and how dependably it works.

The cow, cat and sheep are reed sound toys that will be familiar to many, because they have been around and available forever, seemingly. I'm speaking of the short cardboard cylinders, about 2" high and 2 1/2" in diameter, that give out a mournful, protracted *baa* or *moo* or *meow* when you turn them back right side up after first turning them upside down. The metal lids are perforated with small holes to let the sound out; the exteriors of the cylinders are typically papered over with bucolic scenes. No manufacturer name or place of origin appears on the copies of the toy that I have in my possession, but they often can be found in import shops in China towns across the country. These toys are highly expressive little things. By partially covering the holes in the lid to restrict the airflow, and by tipping and shaking the cylinder in different ways, you can get a wide range of sounds, all of them having the pleading, heart-pulling quality of a baby's quiet cry. OK, then, what is inside those cardboard cylinders?

A hockey-puck-shaped weight of concrete, 1" high and of a diameter slightly less than the inner diameter of the cardboard cylinder, fits within. A reed is built into the underside of this weight, in such a way that air passing into the reed from below the weight will find its way out a hole in the top. When you invert the cardboard cylinder, the weight slips to the top, creating a reservoir of air in the lower part of the cylinder. When you right it, the weight drops back down. But it drops slowly, as the air below, with no place else to go, is forced through the reed as the weight descends.

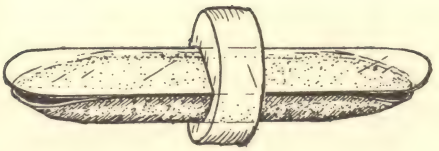
That's the basic picture. Here are the refinements.

First, a light, flexible latex membrane glued between the periphery of the weight and the inner sides of the cardboard cylinder forms a seal, ensuring that air does not rush around the sides of the weight rather than passing through the reed. This means that the weight need not be perfectly snug, but can be loose-fitting enough to slide easily up and down. In reading the above description, it may have occurred to you that when the cardboard cylinder is initially inverted, air must rush through the reed in the opposite direction in order to fill the lower half of the chamber. By the nature of its construction, however, the reed doesn't sound when the air passes through in this direction — thus, no sound when you first invert the cardboard cylinder.

The passageway though the reed and out through the other side of the weight is one of the key elements of the device. It isn't simply a hole drilled through the weight. Instead, after passing out of the reed, the air follows a channel which circles the undersurface of the weight before arriving at a hole passing through. The channel is covered with a wax paper glued over the surface, which turns the channel into a tunnel. In effect, this is like the tubular body of any wind instrument.

The reed consists of a very lightweight metallic tongue placed over a metal trough — a one-sided version of the metal trough in the two-in-one reed for the bicycle horn described above. The reed for the lower-toned cow — the mooing toy — is larger and appears to be slightly heavier than the reed for the higher-pitched sheep cylinder. The air column channels for each, interestingly, appear to be about the same length and diameter.

Giggle Stick, *Magic Bar* and *Groan Tube* are among the names applied to a wonderful sound toy that became popular a few years back, and has since receded a bit in popularity. Although it looks and sounds quite different, its operation in principle is identical to the cow and sheep just described. A giggle stick consists of a tube, a little less than 18" long and an inch in diameter, with an air-tight cap on one end. Inside is a cylindrical plug that slides along when the tube is tilted. Because of the sealed end, the sliding causes air to pass through a hole in the plug, which sounds a reed located within. Between the shifting tube resonances as the plug slides, different sliding velocities and the variations in air pressure resulting from different shaking and tipping motions, you can get a wonderful array of sighing, moaning, laughing and crying sounds. For more on giggle sticks, see the letters section in *EMI* Vol. IX #1, September 1993.



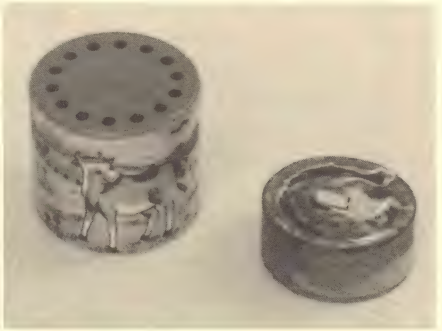
ABOVE: Sketch of a type of reed commonly used in toys, this particular one being the two-way, double-ended sort. The trough below is of aluminum. The reed, in the form of a thin, flat, semi-transparent plastic strip, rests on the rim of the trough. A plastic disk with an appropriately shaped hole through it holds the two together. Notice that the trough curves down and away at the ends, leaving a gap between the rim and the reed in rest position.

BELOW, FROM TOP TO BOTTOM

Three reed horns for children's bicycles: 1) the simple horn described in the text, 2) a similar one but with an added gimmick in the form of an expandable tube section; and 3) a double reed horn (one of the three bells is a dummy) with an accordian-squeeze bulb of the sort described later in the text.

Mooing cow, and, beside it, the concrete disk with reed embedded taken from the similar baaing sheep.

Accordian squeeze bulbs with reeds, purchased from an industrial surplus mail-order house.



Razzers and *Whoopee Cushions* are staples of the practical joke industry. Both use air-gating mechanisms, qualifying them as reed instruments. They don't use the beating reeds we've been discussing so far, however, but a reed form that I've taken to calling *labial reeds*, for want of a better term. Labial reeds are reeds which operate like the trumpet player's lips: instead of slapping shut under air pressure like a beating reed, they are initial closed; they open outward under air pressure from behind, then spring back shut, only to open again and repeat the cycle.

I have long asked myself, what was it that Spike Jones used for the *Pttthhhppptptpptppt*! sound in the classic World War II song "Der Fuehrer's Face"? ("Den ve Heil — *Pttthhhppptptpptppt*! — Heil — *Pttthhhppptptpptppt*! — right in der Fuehrer's face!") In the liner notes to a record that I had, it was identified as a "rubber razzer." I didn't, and still don't, know exactly what that was, except that it produced the most convincing "Bronx cheer" sound I had ever heard. While I may not have Spike Jones' secret, the best thing that I've found to produce this sound is a balloon with part of the body cut off. Pinch the neck between thumb and forefinger with both hands, and blow through the mouth. The free end flops all over the place as the air rushes out through the neck and whatever remains of the body, like a pair of very loose, wet lips. Different sizes and thicknesses of balloon produce different tone qualities. You can get very different sorts of razz by cutting the body off at different points, and by applying different amounts of stretching as you hold the balloon with two hands at the neck. If any readers know more on the subject of professional-quality rubber razzers, I'd be interested to hear.

Until recently, I had also wondered about whoopee cushions. I had often heard of whoopee cushions; and seen them promoted in the backs of comic books, but not having ordered one when I was a kid, I never did know what a whoopee cushion actually looks and sounds like. Eventually, I managed to get hold of a commercial model, and have since seen another similar one in a store. A whoopee cushion, all jokesters should know, is an air bag that you can leave inconspicuously on someone's chair, preferably amidst polite company, designed to make a farting sound when the victim sits down. The cushion turns out to be a rather large balloon — just under eight inches in diameter uninflated, with a bigger-than-usual mouth. When filled with just enough air to puff it up without noticeably stretching the latex, it lies there like an extra-fat jelly fish. It comes with a large popsicle stick, which is to be inserted crossways into the neck, stretching it tight. Without this, the air wouldn't stay in the puffed up balloon as it lies on the chair. Also, the air would pass through the neck too freely when the balloon was sat upon, producing an exhaling noise rather than the desired farting noise. The stretching at the neck and the resulting constriction solves both problems. Getting the stick placed just right in the neck for optimal effect takes a bit of experimenting. When you place it right you get a reasonably convincing sound. Getting somebody to sit down in their chair without noticing a large, half-inflated balloon there might be more difficult. Putting the whoopee cushion under a slip cover with just the mouth protruding might help.

ACCORDION SQUEEZERS

Accordion squeezers don't comprise a separate sounding mechanism in themselves, but rather a clever way of generating an air flow which then can be used with reeds or edge tones. This category, as a result, overlaps with the preceding two, but since the device has turned up in a lot of toys lately, I wanted to highlight it.

Accordion squeezers are in principle much like the squeeze bulb on a bicycle horn. But in place of the squashable bulb is a cylinder with accordion-fold sides, allowing the thing to be compressed from the ends. Among the toys I've gathered is a "Turbo Horn," a conjoined set of reed horns much like the beating reed bicycle horn described earlier, but with beating reeds driven by an accordion squeezer. That's fairly conventional, but accordion squeezers also work in some situations where a bulb would not. For instance, I have seen a toy hammer, in which the head of the hammer has an accordion squeezer built in. Striking the hammer on any surface abruptly compresses the squeezer, sending a pulse of air past an edge and making a whistle sound.

In my favorite surplus catalog (American Science and Surplus, 3605 Howard St., Skokie, IL 60076), I came across a supply of accordion squeezers. They weren't a part of any larger toy, although that probably was the intent before they found their way into surplus. Each one was nothing but a red plastic accordion cylinder, a little under 2" high and 2" in diameter, with a two-way beating reed fitted in a hole in the side. I ordered a bunch of them. (Being surplus, they were cheap.) What was especially intriguing about these things was the thought that with them it would be possible to construct a new sort of percussion wind instrument. With a set of accordion squeezers, you could direct the air from each squeezer to a differently tuned reed or edge-tone pipe, and play the instrument by thumping the accordion squeezers with a hand or fist.

BOUNCING BALL PERCUSSION

We can start this category with percussion aerophones. Percussion aerophones are instruments whose sound comes about by the excitation of air in a resonant air chamber. In this they are like other wind instruments, but they differ in that the excitation comes not through reeds or edgetones, but by percussion. Thumping the walls of the chamber or an opening gives the enclosed air enough of a jolt to produce a clear pitch at the resonant frequency. A familiar example is the clearly pitched sound you get when you clump your hand over the open end of a tube.

I have come across just one toy which employs this principle. Regrettably, it was expensive and I didn't purchase it; worse, I have misplaced the descriptive notes I made for myself at the time. So I am working from memory here; let us hope I get the information right. The toy was a percussion aerophone baseball bat. The bat took the form of rigid plastic tube, roughly baseball-bat-shaped, but extra large in the hitting part (about 6" or 8" diameter at the widest point), left open at the far end. If you hit a ball with this bat, the impact of the ball gives the side of the tube-bat an inward jolt, which in turn gives the enclosed air a jolt. The result is a satisfyingly strong, clear tone at the resonant frequency of the air column. The bat comes with a ball of suitable consistency, diameter and weight.

More popular, it seems, have been the racket-ball drums put out by the drum company, Remo. The idea is obvious: Make a racket similar to a tennis racket, but with a drumhead in place of the strings. Hit a ball with it, and you'll hear a drum tone. Great musical athletic fun. The people at Remo know how to make drums, and they've done an excellent job with these drum rackets — they sound great. They hit the ball quite nicely, too. The rackets are sold in pairs, along with a suitable ball. They're a little smaller than tennis rackets. The heads are tightly mounted mylar, with a decorative motif on one side. Each racket produces

a different tone, which makes it easy for a spectator to follow the competition with eyes closed. Swinging the racket around, as one naturally does in playing, creates phase shifts and doppler effects. I don't know if other manufacturers have pursued this same idea; I do know that I had seen something similar done for fun, non-commercially (thanks to Bob Hobbs, Santa Rosa, CA), before I ever saw the Remo rackets.

MECHANO-ACOUSTIC PLAYBACK SYSTEM

This qualifies as one of the coolest things I came across in my investigations. In a world of toys awash with Atonic Talent Robots and Spidermen with asses tingling, I was happy to find a talking toy employing an entirely mechanical voice-reproduction system. This system may be used in many toys, but it came to me in the form of the Teenage Mutant Ninja Turtle action figure shown on the first page of this article. The technology is wonderfully simple and clever, and it works, well, maybe not great, but pretty darn well, especially considering that the toy is mass-produced from inexpensive components.

The turtle figure is sold with a number of long, thin strands of plastic (just under two feet long, 1/32" thick and 3/32" wide). Mounted on the turtle's back is a casing with some sort of mechanism inside. There's a path for inserting the plastic strip on one side of the casing, and drawing it out the other. When you pull it through ... the turtle talks! Different strips are programmed to produce different utterances. Naturally (for those familiar with Ninja Turtle lore), one strip yields a hearty "Cowabunga!" Another gives a "Ha ha ha ha ha!" Another calls out "Pizza Time!" ... and so forth. You can pull the strip through fast, for a high-pitched "Cowabunga!", or slowly, for a lower-pitched "C - O - W - A - B - U - N - G - A ! ", or backwards, for "!agnubawoC".

How does it work?

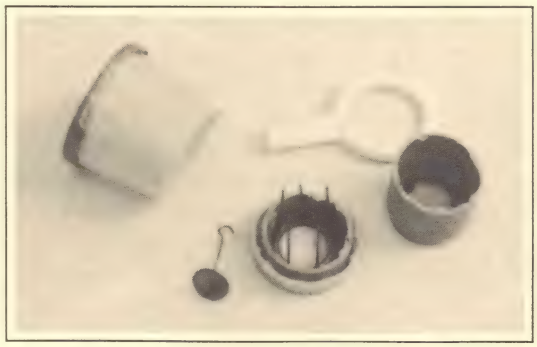
When you look closely at the plastic strip, you see that it is programmed with tiny ridges crossing its surface. In some parts of the strip, the ridges are closely spaced; in others widely spaced; in other regions there are no ridges. The spacing of the ridges corresponds to the vibration patterns of the desired utterance as they change through time. You can demonstrate this for yourself by holding the strip close to your ear, and pulling it through your hand so that it drags over your thumbnail. It won't be loud, but you will hear the tiny voice calling out — "Pizza Time!"

The casing on the turtle figure's back that houses the playback mechanism is cylindrical, 2" in diameter and about 3/4" thick. (The turtle itself is 4" high.) Inside there is a plastic diaphragm. From the center of the diaphragm, a small, narrow point protrudes a quarter inch or so. The point is like the needle of a phonograph. It rides on the surface of the plastic strip as the strip courses through. It reads the patterns in the ridges, and transmits them as patterns of movement to the diaphragm, which in turn radiates them to the air as sound. *Cowabunga!*

Robin Goodfellow, source of many of our graphics and an all-around idea person here at *EMI*, told me of a closely related device she recalls seeing when she was a little girl. It was a wedding or anniversary card that someone had sent to her family. The card had a line of ridges embossed in or otherwise added to the surface, with an instruction that one was to drag a thumbnail along the ridged strip. Sure enough, a faint voice could then be heard: "Congratulations!"

MAGIC-SOUND BABY RATTLE

There is a certain very distinctive sound that I remember from toys I saw and heard when I was little. I'm at a loss to describe it in words. It's a sort of metallic chimey sound, but without a lot of sustain; certainly non-harmonic but without anything like a clangy quality — a sound magical in its simplicity, it seems to me even today, that wants to draw you into a quieter world. I think I remember hearing it in a spinning top, and I also keep getting a memory image of some kind of not-very-bouncy plastic ball that made the sound when it rolled, and it seems like I've also encountered it in some of those things that hang on the sides of playpens as diversion for infants. Now, all these years later, I chanced upon it again in a plastic baby rattle. In all this time I had never figured out how the sound was produced, so I was eager to open up the rattle and see. But the plastic casing of the rattle was un-disassemble-able, and it was with mixed feeling that I found myself destroying the rattle in my attempt to get at its sound.



What magic turned out to be: This is the baby rattle disassembled, showing the upright prongs and swinging beater in the lower center of the photo.

So what was in there? It turned out to be a very small, Waterphone-like array of eight steel rods, varying in length but typically about 1 3/4" long and about 1/32" thick. They rose from a base in the form of a ring of steel, not unlike a large washer. This assembly was housed in a plastic casing within the outer housing of the rattle. From the roof of the casing hung a rigid wire pendulum with a 1/2" steel disk at the bottom. The disk moved about between the tines when the rattle was shaken, striking the tines like the clapper of a bell.

That's it. That's what magic turned out to be.

MUSIC AS FRAGILE AS ITS MATERIAL: The Classical Repertoire of the Glass Harmonica

By Michell Clark

When I was in elementary school in Rhode Island, every year a charming elderly woman, the color of her hair echoing the blue and white of the dress I always remember her wearing, came to our school to give a recital on the "musical glasses." She played folk songs and Broadway show tunes (I can recall a *My Fair Lady* medley), and at one point between selections she would lift the drapes around the table upon which the glasses rested to show that, musically speaking, she had nothing up her sleeve. I remember these recitals fondly, and the fact that she re-appeared year after year imparted a certain quality of the eternal to the *gestalt* of the musical glasses. By junior high school I'd changed schools and she no longer came around, but somehow I can picture her still, visiting elementary schools year in, year out, introducing generation upon generation of fascinated and mystified grade school listeners the sounds of glass.

The ubiquity of glass belies its marvelous properties: sand is heated to become a clear substance, malleable when hot, fragile enough when cool to easily return to a fragmented, powdery state. Glass is an under-explored material for music-making perhaps primarily because of its fragility. Nonetheless, glass has hung on at the margins of Western music, and is now gaining ground as more musicians and instrument-makers experiment with it. With this has come a renewed interest in glass musical instruments of the past.

Nomenclature concerning the earlier glass musical instruments sounded by friction is varied and at times confusing. The earliest form was the *musical glasses,* which appears to have emerged in Europe during the late 17th century. This is the instrument where glass goblets — like wine glasses — are arranged in a base, the edges of the glasses played by being rubbed by moistened fingertips. The *armonica* is the instrument invented by Benjamin Franklin, who was inspired when hearing the musical glasses in England in the early 1760s. This instrument (sometimes called *glass-chord*) consists of a series of glass bowls, with a small hole in the center of each, arranged with one nestled inside the next in increasing size and descending pitch, all mounted on a rotating horizontal spindle. A narrow width of the rim of each bowl is exposed, to be rubbed by the player's moistened fingers. A somewhat problematic term is *glass harmonica,* which may often be used in a general sense as a name for the above-mentioned instruments. A very confusing term is *harmonica,* as we generally know this word as the name of the free-reed mouth organ. Here, I will use "musical glasses" for the wine-glass instrument, "armonica" for Franklin's instrument, and "glass harmonica" as the general term for glass instruments sounded by friction; I will also use "glasses" somewhat informally.

Glass harmonicas, of either the original musical glasses or later armonica type, were immensely popular during the late 18th century. After a time, it became apparent — or it became public rumor — that playing the armonica, perhaps even hearing it, adversely affected the nervous system. (The *human* nervous system; there don't seem to be any accounts of how it affected cats, dogs, or horses, for instance. Given the presence of very high partials and a certain scratchiness to the tone, one would imagine that an eavesdropping dog would have had some opinion concerning the instrument.) The composer J.G. Naumann was said to be one who was severely affected, even only when hearing the armonica. Word of nervous diseases associated with the instrument started to get around, in some places the playing of it would be banned, and its popularity plummeted.

As Benjamin Franklin's invention, the armonica is now considered to be the first "American" musical instrument. And because of its brief career it is arguably the first "failed" major musical-instrument experiment in the modern common-practice era of Western music.

The basic repertoire for the glass harmonica is music written for it during the late 18th and early 19th centuries, mostly in Germany and Austria. The cornerstones of this repertoire are two pieces by W.A. Mozart (1756-1791), the *Adagio and Rondo* in c minor for armonica and four instruments (K.617), and the *Adagio* in C major for armonica solo (K.617a, formerly K.356). Most of the other composers associated with the glass harmonica are generally unknown today, names such as J.G. Naumann (1741-1801), J.F. Reichadt (1752-1814), and J.A.P. Schultz (1747-1800).

Listening to Dennis James' fine new CD of the armonica (*Glass Music*; Glass Music GM-1001 CD) invites comparisons with a re-issue of some of the recordings of the late Bruno Hoffmann, the man responsible for the revival of the glass harmonica in the 20th century (*Music for Glass Harmonica*; Vox Allegretto ACD 8174). The selection of pieces on these two albums overlaps somewhat and both include the Mozart works. As Hoffmann is playing the musical glasses (which he called "glass harp," and which the album title and notes call "glass harmonica"), certain aspects of the playing differ from those of the armonica. (A number of the Hoffmann recordings included here — which as far as I can tell were made in the 1960s — may also be heard on an earlier LP release of Hoffmann's playing, also simply called *Music for Glass Harmonica* [Candide CE 31007].)

Listening to both albums allows one to compare the sound of the armonica with that of the musical glasses. In general, the armonica has more control over legato articulations than the musical glasses — the result of the armonica having the rims of the glass bowls all very close together, allowing for a facility of execution just short of that which would be allowed by a keyboard. Ultimately, though, the musical glasses have a rounder and richer tone than the armonica. The resonant capabilities of the wine-glass shape itself must give each tone a roundness like that made possible by the "bulb" of an English horn (and not unlike the ability a wine glass has for "focusing" the bouquet of the wine). But all in all, these two recordings need not be considered mutually exclusive: each offers aspects of the "glass harmonica" that complements the other, and each in its own way gets at the essence of the role this instrument played in the music of its time.

As an instrument's repertoire is ultimately tied to its idiomatic and organological features, let's take a look at a few of the compositions for glass harmonica found in these recordings. One of the fascinations of the glass harmonica is that its sound can embody the qualities of many different kinds of instrumental timbre — having at times the quality of bowed strings, of woodwinds, even of a handbell choir. But as an ensemble instrument the glass harmonica's tone is somewhat weak, and as part of an ensemble texture, it seems at times that all it has to contribute is a scratchy aura. The most effective compositional solution in the ensemble pieces is a technique of alternating the glasses and the ensemble itself.

The Mozart pieces show off these features of the glass harmonica's sound and musical role very well. In the *Adagio and Rondo* in c minor — scored for armonica, flute, oboe, viola, and cello — there are times when the glasses blend effortlessly, in a sequential fashion, with the other instruments. At one point the ensemble, with the flute at the fore, segues into the glasses alone and the transition of the timbre is seamless. An interesting hallmark of Mozart's approach to the glass harmonica is that in both this piece and in the solo *Adagio,* he had a penchant for the occasional ascending chromatic line. In Hoffmann's performance of the solo *Adagio* the resonance of the musical glasses (described above) contributes most markedly to the high ascending chromatic passage early in the second part of the piece coming across as an ethereal glissando.

J.G. Naumann's *Duo* in G, originally for lute and armonica, is presented on James' album in an arrangement for armonica, two violas, and cello. In the original version with the lute (which may be heard on Hoffmann's earlier Candide LP but which unfortunately is not included in the Vox CD re-issue) the two instruments are well balanced, but in the arrangement James performs, involving bowed strings, the armonica is less distinct. Also, what is lost by re-arranging this piece is the historical irony implicit the original instrumentation: the combination of two instruments which could perhaps not be more different — the lute an anachronism by the late 18th century, the last gasp of an earlier Western art music culture so rich in the sounds of plucked strings, and the glass harmonica a fad in the fresh bloom of its youth, destined to fade in another generation amid ambiguous stories of "nervous diseases."

Now, how often do you read about music by Beethoven in *Experimental Musical Instruments*? The melodrama "Es bluht eine Blume" from the play *Leonore Prohaska*, included on the Dennis James recording, is Mr. B's only work for the armonica (1814). In this piece, the instrument forms the musical backdrop for the recitation of a brief text on the topic of love and death. *Melodrama* — that is, dramatic presentation of spoken text with musical background — was at the height of its popularity during Mozart and Beethoven's time. To hear an actual example of this early melodramatic text-setting is very interesting, and an appropriately jarring finish to an album of this ethereal and appropriately romantic instrument.

With the efforts of Bruno Hoffmann, Dennis James, and others, the musical glasses and the armonica are finding their way back into the music world. Whether the focus with these instruments will be primarily on the existing repertoire of the late 18th and early 19th centuries, or whether a flurry of new compositional activity will be stimulated, or whether *My Fair Lady* medleys are its fate (as enjoyable as these are in their full synaesthetic blue-and-white, water-and-glass experience), is something that remains to be seen.

Text by Davey Williams *Illustrations by Hal Rammel*

New Discoveries from the Cloud Eight Archive of Musical Instruments and Fortean Musicology

THE PREHISTORIC BRASS/WOODWIND CONNECTION

In March 1994 ***Experimental Musical Instruments*** published the first installment of Fortean musicologist Davey Williams' on-going investigations into the unusual musical instruments long buried in the Cloud Eight Archive's dusty storehouse. In this second chapter Mr. Williams establishes a lineage of brass and woodwinds where none was heretofore known to exist.

Our initial researches at Cloud Eight had fairly firmly established that early music preceded modern music. But with the discovery of the instruments illustrated in this article, we had to confront a new twist in the evolution of music and musical instruments.

Before the earliest instrumental music existed, before the first musical instruments, there existed an even earlier class of musical instruments, as evidenced by the illustrations herein. And this is their story, the saga of the brass and woodwind family of instruments that just couldn't cut the mustard.

The oldest dedicated instrument in the Cloud Eight archive is the brass piece in Figure A. As can be seen, the relatively primitive state of brass instruments is immediately obvious to the trained eye.

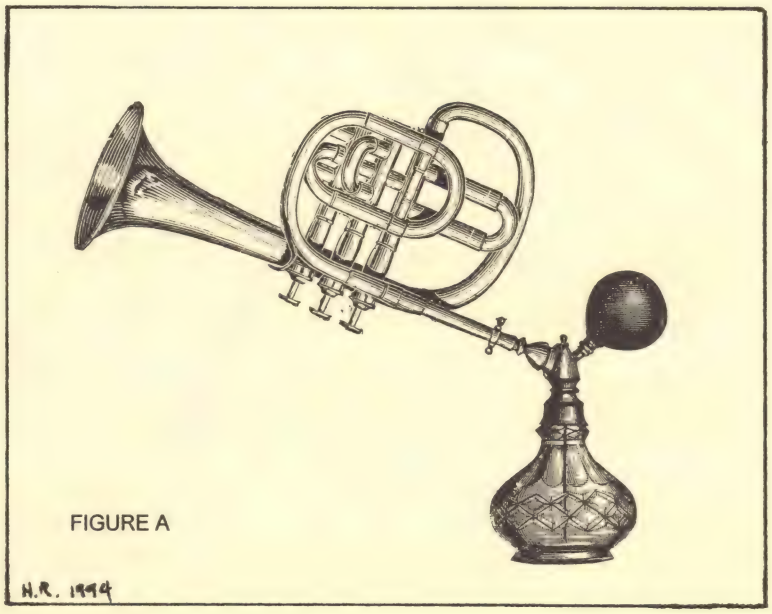


FIGURE A

The curved tube and bell, as well as the keyed valves, were quite sophisticated for the epoch in which they were made. (This example has defied our efforts to positively date it, but we know it was made in October.)

However, the atomizer bulb device at the bottom of the horn proves conclusively that, at this stage of development, it had not yet occurred to musicians to play wind instruments with their own breath.

This is corroborated by the written music we have from this period, which consists entirely of a sheet of old paper with what appear to be coffee stains sprayed in random and generally uninteresting patterns on it.

Clearly, there was room for improvement.

Later that same autumn, we see the independent development of the first known predecessor to the woodwind instruments that we know today. Despite being contemporary to the brass instrument in Figure A, the woodwind in Figure B was not only much more primitive, but a far less successful attempt at horn-making.

While they had the right idea in the reed and the wooden body, the would-be instrument contained several critical flaws in design and concept.

Firstly, not only did it not occur also to these ancient musicians to blow on the mouthpiece, they also failed to realize that a wooden instrument was not still a plant.

Thus, despite the rather advanced wood-working of the instrument's body, the early musicians obviously have left what should be the bell of the horn in its living, botanical state, even going so far as to water it!

Persistent though not ingenious, the early instrument makers attempted a modification of the instrument to be an "electric woodwind." The results were unsatisfactory, to say the least; and if the instrument were watered while plugged in, the ensuing events must have come as a catastrophic setback to the would-be musicians.

We fast-forward now to the invention of the woodwind instrument bell. This is the first item in this section of the Cloud Eight archive which can be positively dated— it was built on or about January 16.

Inspired by the elegant shape of a perforated whatchamacallit (pictured at right in Figure C), the unknown craftsman invented the forerunner to the woodwind bell. The confusion between plant and wooden object is still evident, of course.

Despite this apparent connection to the flaw in design of the pre-woodwind in Figure B, the maker of the first bell fared no better than the earlier would-be woodwind maker, for he (or she) had merely created a bell without a horn.

This shortage of workable instrument ideas put the whammy on the horn section as we know it today. At this neophyte stage, the horn section was pitifully inadequate, consisting (according to contemporary descriptions) of a few morose musicians on the bandstand waiting for their instruments to be invented, hastily improvising the vaudevillian tradition of stand-up comedy. Meanwhile, their audiences gathered vegetables for throwing, reflecting the rural character of music audiences, so long ago.

In Figure D we see pictured the first successful woodwind instrument, or more correctly, the first woodwind machine. Invented by a railroad worker, Thaddeus Partly Fardworthy, a.k.a. "The Honkin' Hayseed," this one-off instrument almost took Fardworthy into the big-time. With his traveling band, "the Honkin' Hayseed and his Several Hairy Feet," the former railroad man drew popular and critical acclaim from audiences throughout the backwoods South and Midwest, and on the island of Guam.

His instrument was a brilliant combination: a brass horn's bell and a woodwind's reed. The instrument is a work of obvious inspiration and mechanical skill, and is entirely practical as a playable instrument except for one major drawback.

Reflecting Fardworthy's previous vocation with locomotives, he chose to build his instrument from his material of familiarity,

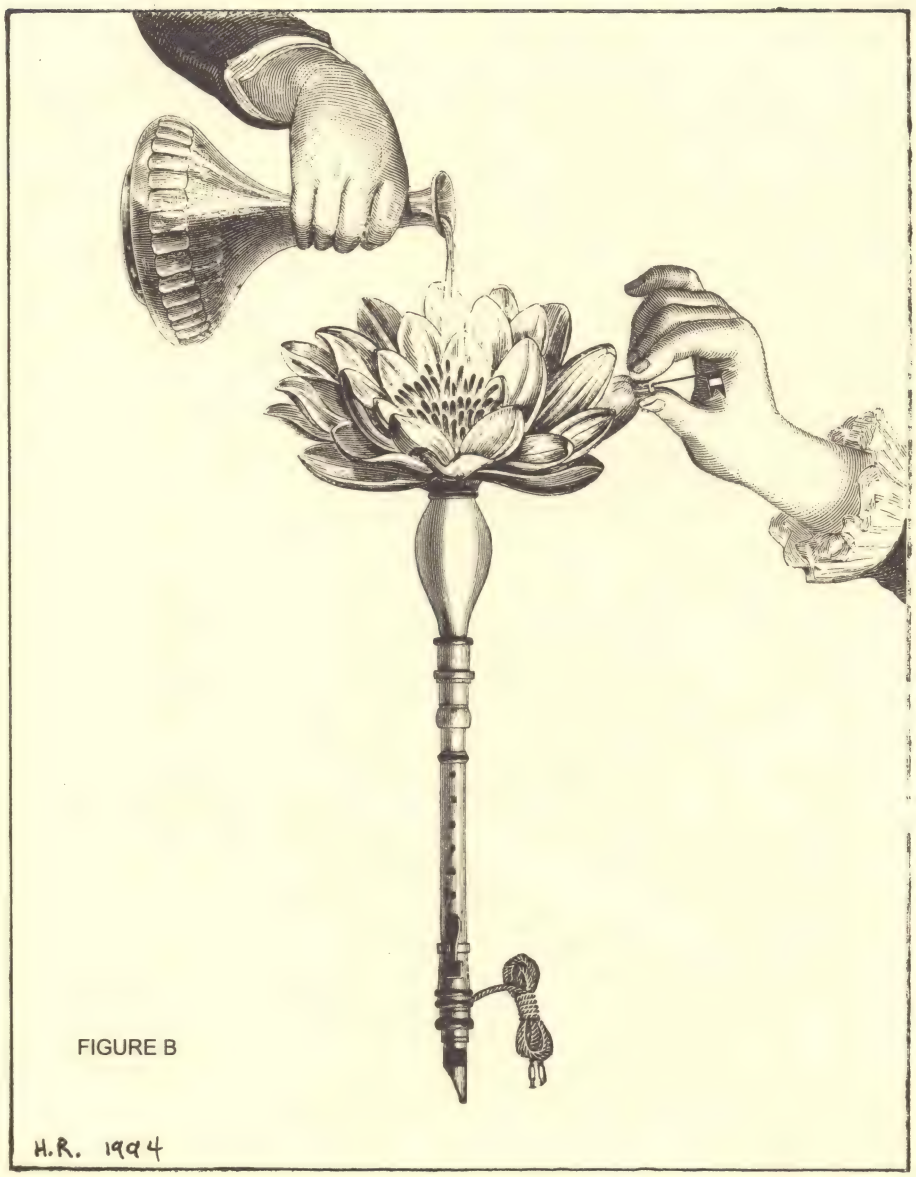


FIGURE B

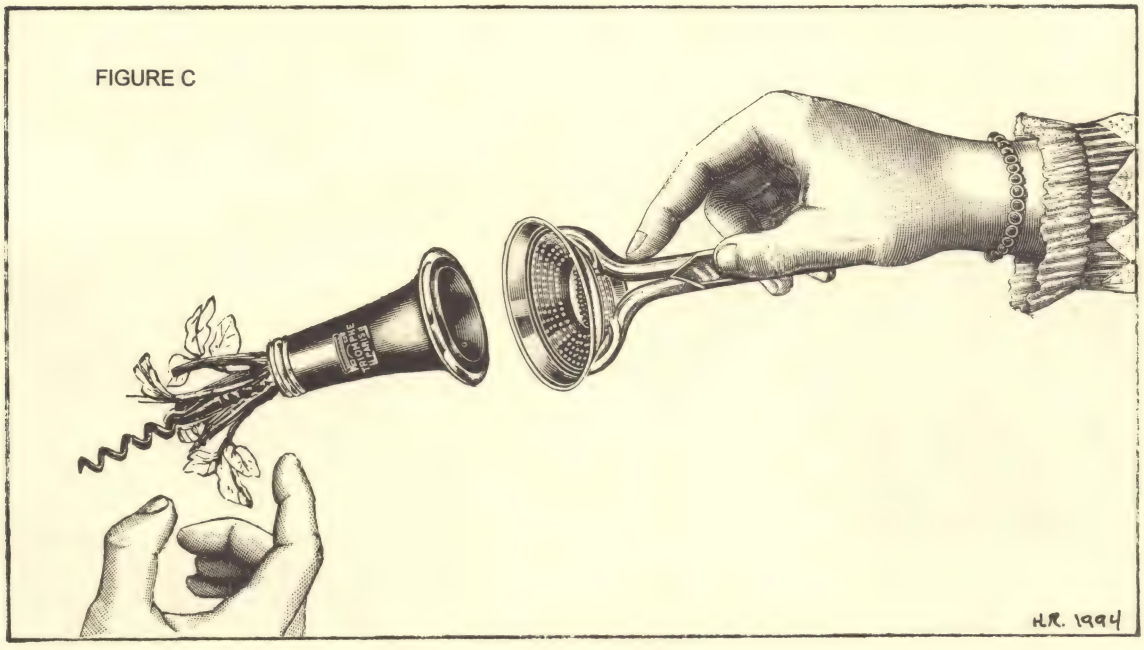


FIGURE C

which is steel; consequently his instrument weighed in on the Cloud Eight musical scales at a hefty 225 pounds.

Mindful of the past woodwind failures, Fardworthy thoughtfully included a floral motif engraved in steel around the middle of the instrument; indeed it is this which is responsible for much of the instrument's great mass. This excessive weight eventually caused the inevitable downfall of both the instrument and "the Hayseed Honker," usually about halfway through

the second set.

As is often the case with innovative and largely impractical devices, the military got interested. A few years after his original invention, a project gained huge government funding following the Hayseed Honker's regional hillbilly-circuit hit song, "It Was Rough But We Made It."

The Army commissioned Yardworthy to build a strange weapon prototype, the "militarized" version of the woodwind/brass music machine pictured in Figure E.

That may sound absurd but it must be borne in mind that this period of time (early afternoon before the paperwork was done) was not only very early in the development of musical instruments but in the development of the military as well.

In this light, it is not surprising that the military had not fully appreciated the difference between, say, an army and an army band. But if the military was in the dark at this time, by all evidence Yardworthy plunged into his mission — which was declared TOP SECRET— with an inspired zeal, concocting a truly marvelous invention.

"50% musical instrument, 50% musical weapon," declared the chairman of the Senate Committee on TOP SECRET, "and 100% folly." In retrospect, the Senator's opinion was hasty, rendered only in light of the thing's non-existent destructive potential, and neglecting any appreciation of the brilliance of Fardworthy's design and conceptual skills.

Be that as it may, the woodwind device is awe-inspiring, and has a surprisingly sweet tone. Moreover, it is the first known woodwind to forego a reliance on brass instrument parts, and the first to resemble the modern-day clarinet, albeit *by* chance.

Except, of course, Fardworthy's invention was only part musical instrument. In any case, the instrument was ingenious, a two-person crew being required to play it (the army manual insisted it was "operated, not played.")

While one player, the "musician operator," blew through the mouthpiece and fingered the notes in much the same manner as today's reed players, the second crew member, the "aiming operator," used the camera to measure the range to the enemy and focus on him.

FIGURE D

H.R. 1994

An interior linkage system calculated the proper key and volume to reach the enemy and transposed it to the "musician operator's" clarinet keys by means of the zither-like strings in front of the pistol-grip. (The device weighed nearly one hundred pounds and was obviously supported by a tripod, for which fittings can be seen on the underside; for the purposes of Cloud Eight's tests, a small fork-lift was used.)

The pistol-like trigger merely releases the camera's shutter in order to record the effects of the instrument/weapon upon the enemy. In field testing, these effects proved to be negligible, perhaps predictably. The photos from the device's tests show only distant soldiers cupping their hands to their ears, obviously straining to hear anything at all.

Eventually, the Army canceled the project, declared it no longer TOP SECRET, and Fardworthy lugged his remarkable instruments into obscurity, to be forgotten by all but his old railroad buddies, and the odd Several Hairy Feet fan.

The development of woodwind instruments fell into decline, and even disappeared entirely until an completely independent lineage emerged, paving the way for the invention of the oboe by Mozart, shortly before the advent of hi-fi.

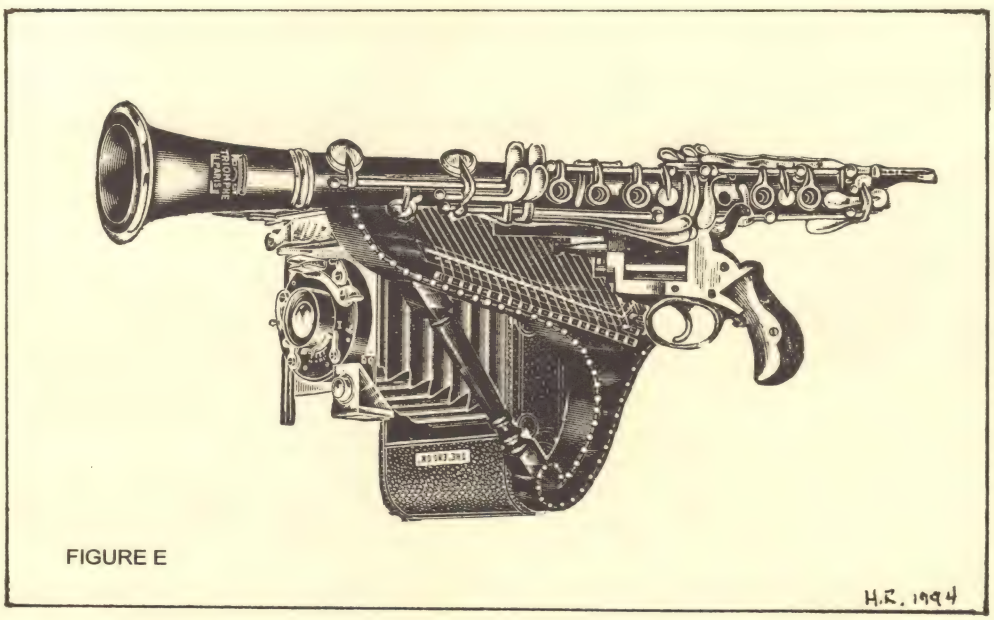


FIGURE E

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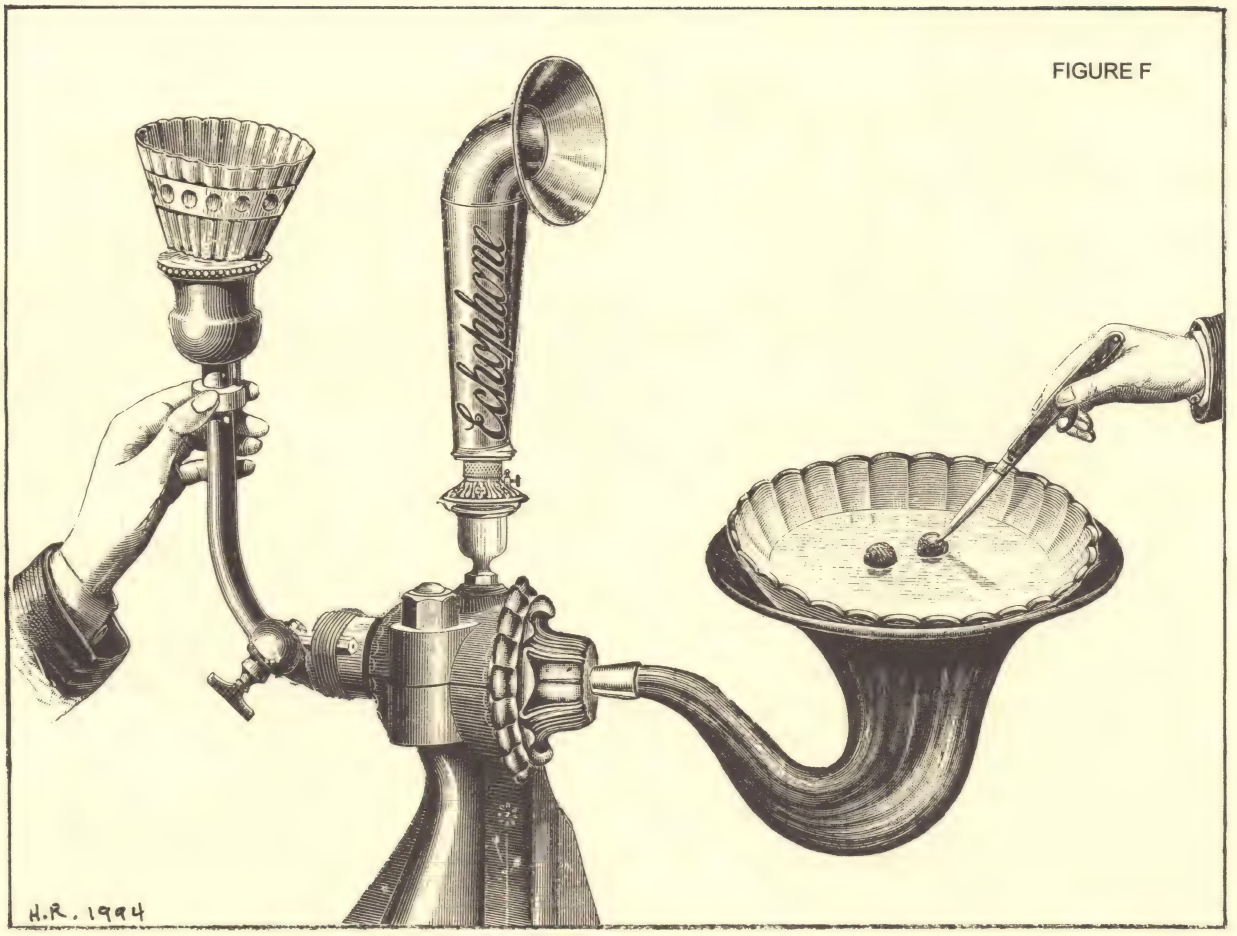


FIGURE F

Though discouraged, even ridiculed, Fardworthy was not through yet. The "Hayseed Honker" actually built a final instrument-like device following his all-too-brief period of celebrity. Frustrated by his unsatisfactory experience with the military, Fardworthy turned his odd musical brilliance to the innocence of a child's game, as see in Figure F.

Using a small penknife, the player on the right attempts to puncture either of two overcooked navy beans which are lying in the bottom of a type of pie-crust. This in turn sits in the bell of an acoustic sound collector, which works much like the old-fashioned hearing trumpet, collecting the sounds of the navy beans moving around against the pie crust as they resist the dull butter knife's blade.

This sound is translated in the central section of the instrument/game (with its traditional floral motif, embossed in pressed steel, of course; this children's game weighs about four hundred pounds), into air waves which travel up the stem on the left to the second player, on the left in the illustration.

The second player uses a kind of mechanical "mouthpiece" (actually a loose valve) to jostle the airflow through the somewhat ornate bell, modeled after a badminton shuttlecock, which is balanced unsteadily at the end of the stem, controlled by the second player.

The player of the navy beans can win if he/she can use the generated airwaves to knock the bell off the second player's "horn" (the first known use of the term "horn" is in Fardworthy's instructions in which the device was wrapped.)

The second player can win in two ways: first by blocking the passage with a strong enough back pressure from the mouthpiece to force the navy bean player's airwaves backwards, moving the navy beans for a certain number of points.

Secondly, if the knife of the navy punctures the navy beans, their resonant potential is moot, so the back pressure of the second player automatically wins.

In any of the three winning events, a valve in the center of the instrument/game transfers the winning air wave up the central pipe in the middle, which lets loose a loud, sustained honk remarkably similar to that made by the instrument in Figure A.

Perhaps it's ironic that the final evolution in a lost lineage should ultimately constitute an elaborate and seemingly far-fetched improvement on its most primitive example.

Apparently, a failed evolution line of wind instruments had returned with admirable success to its original, inferior, basically unworkable state, but only in terms of being a musical instrument, not in terms of music itself.

After all, if genius is "two per cent inspiration and 98 per cent hard work," then why should it matter if these horns didn't keep musicians employed? By all evidence, they didn't work at all as usable musical instruments, yet their value to us today is immeasurable.

To the beginning is indebted the end, but the beginning is in turn indebted to the obviously flawed and undeveloped idea, absurd in conception, incredibly misconstrued, yet pursued with all the inspiration of an absent skill.

Almost everything starts out as something stupid, no matter what it becomes.

NATURE ON RECORD Part 2 by René van Peer

The second part of this series will focus on soundscapes. These feature sonic impressions of how environments sound, mostly through the animals that live in them. Recordings of environments defined by manmade activities do exist. The reader should keep in mind that in these articles I restrict myself to sounds from nature. The meaning of the term "soundscape", when used here, is therefore limited to recordings portraying natural environments. I want to discuss some general aspects of this area, referring to particular albums to illustrate my points. At the end I will give a list of albums that I used for writing this part of the series. But first I want you to join a young researcher trying to catch singing insects in the high grasses of midsummer.

In the 1930s at the height of summer Vincent Dethier was busy collecting New England species of grasshoppers and their relatives. "As I swished through the knee-deep grass," he writes in *Crickets and Katydids, Concerts and Solos*, "I noticed for the first time that the field shone more golden than green in the morning sun. The only sounds that I heard near at hand were those of ground crickets. From higher up in the field the only sound was that of the mowing machine.

"The closest field lay just below the Cannon's house. I took a shortcut through a thicket of choke-cherries, hazelnuts, and briers separating the Pierce and Cannon properties. When I emerged into the sunshine, I sat down on a knoll to listen, first for general impressions, then for local details.

"The first sound was the trilling of ground crickets; that was expected. They were close at hand, almost at my feet; they were loud; they were numerous; they were familiar. It was even possible to single out by ear enclaves of Striped Ground Crickets among the more numerous populations of Allard's Ground Crickets. The field throbbed with the trilling and chirping. I closed my mind to this background music and searched with my ears for anything different. Sooner than I had expected, I picked out two other sounds, a very faint wheezing close at hand and a louder high-pitched buzz in more distant parts of the field."[1]

At the time Dethier worked as an "entomological factotum" to professor G. W. Pierce who recorded the sounds of these creatures, publishing the results of a twelve years study in *Songs of Insects* (1948). What he had originally been after were sounds in nature with pitches above the human hearing range, a spin-off of his research into the production and detection of high-frequency sound for the US Navy during the First World War. Dethier, a novice to the trade of catching and distinguishing these singing insect species, joined Pierce as an assistant in his investigations for three years.

As the quoted paragraphs indicate he developed a sensitivity for their sounds. He had to, as he comments on an episode that saw the expedition climb Mount Washington. There they were looking for a species of meadow grasshopper that differs from its common relative by the absence of clicks between sequences of pulses: "It seems to be a trivial reason for climbing a mountain, but we did not know in advance that the difference was so minor. To human beings it did indeed seem trivial; for the survival of the species it was not. The song serves to bring the sexes together. Imagine being on a mountain top or in a field of grass, and being small, less than an inch in length. Imagine the formidable difficulty of trying to find a mate in those vast uncharted spaces. All the singing insects face this challenge.

"Calling-songs are the solution to this problem. Appearances are neither distinctive nor meaningful, but an acoustic signal to which the female can orient and home is essential. And the song must be correct in order to lead the female to the genetically compatible mate, otherwise consummation, even if completed, is fruitless. The small musical differences may be inconsequential to us, but to the females they are crucial."

LISTENING TO A LANDSCAPE

Dethier did not only acquire a keen ear for Orthoptera. He discovered how shifts in timbre mark the passage of time, how different species of insects provide as much a clue to that as do agricultural tools and machines. He learned to appreciate the sounds of the landscape in its totality, as the wealth of references to them in *Crickets and Katydids* testifies. Often he uses images from music to describe the impact all the vocalizations made on him: "We were fast approaching the climax of the insectan symphony. Since the balmy days of June, more musicians had gradually been added to the orchestra. The music had already developed a richness, complexity, and change of mood. New sounds, tempi, and sequences were being introduced. Admittedly, musical analogies are stretched because in the world of insects each instrument is a primitive device tuned to a single pitch. On the other hand, there are many kinds of instruments and thus many tones in the composition. There are also, when all things are considered, passages forte and pianissimo, choruses, solos, variations on themes. There are no melodies as such, no composer to orchestrate the whole, and no conductor to interpret and direct, but the ultimate expression is a paean of nature.

This is the second of three installments in the author's tour of available nature sound recordings. The first installment appeared in EMI's last issue (Vol. 10 #4, June 1995), and the final installment will appear in the next (Vol. 11 #2, Dec 1995).

1. Vincent G. Dethier: *Crickets and Katydids, Concerts and Solos* (Harvard University Press, 1992); quotes from the book used with permission.

"Despite all the analogical contradictions, the effect is neither cacophony nor the 'white noise' of physicists. The field as a whole projects a composition, almost a tone poem, that reflects successively the advent of summer, its fulfillment, its passing. One can listen to the field, and the woods as well, and so mark the days of summer."

At times Dethier's descriptions (all based on extensive notes that he made when hunting for professor Pierce)[2] transcend musical imagery, becoming at once more abstract and more direct: "As we reached higher altitudes, the silence was ruffled by the murmuring of the forest. A cool wind flowing down from the mountain ridges was stirred into small vortices by each twig and needle that it encountered. These vortices produced faint sounds, but the combination of hundreds of these aeolian noises caused the whole forest to whisper. Each tree had a different voice, and a voice for each season. The bare hardwood of winter presents to the wind thousands of twigs of many sizes. These arboreal harps sing with a multitude of low tones. The needles of conifers, being more uniform in size, cause a limited range of high tones when played upon by the wind. The twigged maple moans while the needled pine whispers. Together the voices of legions of trees join in concert, such that the whole forest murmurs."

As the title of the book suggests, it deals primarily with singing insects. That is what Dethier's narrative hinges on. But he himself is there as well, as a spectator, as a listener, as an actor and as an intermediary. Inevitably his presence shapes the landscapes that the reader gleans from the pages. These can be wide and open, but just as often Dethier will zoom in on a tiny detail and make clear how it relates to the whole. By likening his sounding environment to music he apparently wants to stress the grandness of nature as he experienced it. To my opinion he manages to breathe life into his portraits when he steps outside the domain of music into the realm of sound. Or maybe I should say, animated sound; the murmur of the forest on the slopes of Mount Washington makes Dethier realize why "early peoples" viewed their surroundings not simply as geographic areas but also as living and conscious entities. It is the different strands of perceptiveness coming as flashes of insight and running like a deep current throughout the narrative that, with its carefree tone, give this book a rare appeal.

SOUND PORTRAYAL

Dethier's writing and soundscape recordings show some remarkable parallels. Both document the landscape from the position the author has taken within it. However immediate and true to life these portraits may feel, between the first hand experience and its recreation in the mind of the reader (or the ears of the listener) usually lies a length of time and a lot of work. As I understand it, apart from a variety of possible motives, immediacy and truthfulness are indeed basic aims inherent in sonic representations of natural surroundings, the former more easily achieved than the latter. According to Catherine Girardeau (*EMI* Vol 10 #2) Bernie Krause's CD *Amazon Days, Amazon Nights* was mixed from 170 tracks. Jean C. Roche told me that he used to compose his "environmental concerts",[3] starting with a steady background over which he laid down individual songs (or calls) and choruses, weaving these into patterns that progress from one highlighted species to the next.

An intended free flow, an apparent natural looseness, is often the result of meticulous editing. I will not discuss technical details or motivations; that, I think, is best done by the recordists themselves. I do feel that I have to mention it, though, for several reasons. One is just to draw attention to this paradox,[4] which (I must admit) was something of an eye opener when I first heard it. Another is that editing may have consequences for what is actually on record. The tapestry of sound may be rather dense and eventful, suggesting a population pressure that one would associate with Hong Kong rather than the great outdoors. Sounds with different reverberation characteristics can sometimes occur together, reminiscent of the transparent flat backgrounds used in cartoons to create a sense of depth. In some cases one gets the impression of listening to a sonic slide show, species following one another as if placed on a conveyor belt in front of a colorful backdrop. In some cases each time when within a sequence one specific call or phrase is repeated, another may trail behind, even though there is no apparent connection between the two other than the fact that they must have occurred simultaneously at the moment of recording. Close listening sometimes reveals clicks where a tape is started, or a sudden increase in background hiss.

One of the main problems in constructing an accurate sound image of any environment is the fact that aural perception, which incorporates the three dimensions on all sides, is reduced to one horizontal axis when using headphones or one and a half when playing over loudspeakers. As a consequence sounds are only distributed over a horizontal plane; a lark warbling overhead will not to one's ears be higher off the ground than the chirps of a hopping sparrow. At one point on the first track of *Solitudes* (a sampler album with excerpts from CDs in Dan Gibson's soundscape series of the same name) a curious regular splashing emerges, shifting from left to right. I was at a loss just what this could be. It sounded as if a current gurgled around my head, or even right through it. Had the sound been projected downward and behind me, I might have recognized it for what it was without consulting the liner notes — canoeing.

THE SCENERY

There is[5] more to a soundscape than representing an area through the sounds of the animals living in it, although these admittedly constitute its most notable elements. The character of a landscape is also defined by sounds generated through its inanimate components. On two albums that Jonathon Storm made for his label Earthtunes, they are a prominent (though unobtrusive) part of the total image. His *Ancient Forest—Spring Chorus* features in different places in its third track a reverberating and

2. As I was informed by his widow, Mrs. Lois Dethier, during a telephone conversation.

3. He began making these 25 years ago; since 1985 he has issued them through his own label Sittelle.

4. Questions that come to mind are: don't they by editing their recordings express the wish to improve upon nature; and is that or isn't that a respectful attitude towards it; isn't it inconsistent to try and arouse people's interest in nature through something that is so thoroughly artificial? There are more paradoxes involved: the portrayal of, through artificial means, i.e., sophisticated technology, an atmosphere of solitude that can only be created because someone was present; another will be discussed in the next paragraph. The bottom line is of course (as every recordist will affirm) that whichever way you look at it, any single recording is the result of human interaction with (and therefore, interpretation and filtering of) the environment as a whole and elements in it. To what extent artificial construction is used, is then a matter of personal taste.

5. Or, perhaps, there should be.

incessant deep murmur of giant trees, bringing to mind how the forest on Mount Washington impressed Vincent Dethier. Near the end of that track one can hear the dry creaks of wood rubbing on wood.

The physical landscape plays a leading part on the first half of *Rivers of Ice*. This album presents scenes from the life cycle of glaciers. There's a lot of wind and water on it, always different in tone and intensity. It trickles and tickles down your ears,[6] bubbles and sizzles around you, up to the moment that an incredible profound rumble comes on —it's the crash and boom of immense chunks of ice breaking loose from the main body of the congealed, though not arrested, flow. Positively overwhelming and awesome. But then you'll also come across single drops falling off melting icicles, the subdued tinkle of icicles breaking. The combination of the impressive wide view and these small details on one album makes listening to it an extraordinary experience. Storm must have been awed, too, and felt called upon to shape the liner notes into poems: "Such is this life — filled with unfathomable beauty, and merciless change." Lines like these do not work for me; they make me think of a tiny figure with arms opened wide declaiming its noble thoughts and feelings in a shrill voice in the roaring face of huge indifferent ice walls.

Both Storm and his erstwhile teacher Gibson have apparently devised the various parts of their albums as narratives. They audibly move from one scenery to another (brook fading out, then murmur of trees fading in) within one track, carrying birds or other sounding elements with them as it were, in order to maintain a sense of unity. At times Gibson's work betrays his experience as a film maker, especially when he uses sounds of human actions to develop the story line. Moreover, the tracks of his sampler album, sketchy though they may be, generate vivid visual images. Storm, on the other hand, seems to be more of a composer in the way he approaches his material. Every now and then his pieces even gave me the sensation of having strayed into a concert of program music. He does have an ear for fascinating sounds, however, and manages to capture them on tape in immaculate detail. Track 5 of *Ancient Forest* has a startling four minute sequence of Hermit Thrushes, with their ethereal melismatic lines among the greatest singers of the North American forests.

SPACE AND TIME

Another aspect of representing an environment in sound is spacing. This term covers more than one meaning. It may refer to a sense of depth resulting from the way animals are placed within the image and in relation to each other. It may also refer to the rhythm of a place, and the way it is rendered on a soundscape; that is, the number of sound events with the passing of time, or (conversely) the amount of silence allowed in the final product.[7] One of the best examples is the work of composer David Lumsdaine. He sent me a DAT tape containing a 44 minute piece called *Lake Emu*, plus extensive notes concerning this soundscape and four others, all intended for radio broadcasting.

As the duration implies Lumsdaine approaches the place unhurriedly. What is more, and this is something you will not often hear, by his way of recording he reproduces the act of listening, focusing left and right, on sounds close by or further away. You also get the feeling that he has not been anxious to include all species belonging to the place. Instead you perceive (or so it seems) the distance between individual animals, separated as they are by areas of silence. Neither has he been afraid of sequences being relatively uneventful and falling silent from time to time. Through this he has managed to capture an essential part of nature — its unpredictability. Not only do these characteristics give *Lake Emu* a rare and very pleasurable sense of openness, in comparison to other soundscape recordings they make the experience come closest to actually exploring a landscape by ear.

Sittelle made a CD of Lumsdaine's recordings called *Australian Soundscapes*, one of the very few such albums devoted to that continent. This fact alone should make it worthwhile. One of its attractions is a recording of Grey Butcherbirds, a species with a well-developed social life, expressed in antiphonal group calls. Each clan has a musical repertoire of its own. The calls have a remarkable nasal quality, as if occupying middle ground between a flute, a clarinet and a trumpet. The melodies are gripping, reminiscent of the Latin American Musician Wren by the ease with which the birds jump large intervals and by their closeness to the human way of composing phrases. Of *Lake Emu* only a fragment is featured on this album, regrettably. It would have been a challenging notion to make a CD of one piece only, taking its time to trace the true nature of an area no larger than the ear can reach.

QUIETUDE

Many recordists profess a deep appreciation for silence. Dan Gibson calls his series of CDs *Solitudes*; Bernie Krause states on the insert of *Amazon Days, Amazon Nights* that his compact discs "are designed to give the listener a sense of the serene presence of each environment;" on the insert of *Ancient Forest* Jonathon Storm writes, "The ancient forest, in contrast to our Age of Noise, has a very quiet voice. One must enter in silence to hear its song." The California Library of Natural Sounds, affiliated to the Oakland Museum, dedicated a CD to it, *Quiet Places*. It is one of those slide show albums, possibly because it was made for educational purposes. What is interesting, is that its producers have tried to give the listener an impression of how the various types of habitat of the state may have sounded before the Europeans arrived. It moves inland from the coastline to the desert, sketching the backgrounds and filling these in with species belonging to them.

In the liner notes the following thoughts, to which I fully subscribe, are expressed: "Since that time [i.e., when the Europeans arrived 200 years ago — *RvP*], human populations and technology have reduced alarmingly the habitats available for California's numerous, diverse species. Today, as a result, many are in danger of disappearing. Also threatened are the 'quiet places' where the pristine sounds of nature can be heard. For many of us, any natural area seems peaceful. However, when we focus on the sounds of nature, we hear at an ever-maddening level the sounds of automobiles, airplanes, chainsaws, generators, and even the din of others like ourselves. Even in places where large areas of untouched natural habitat have been protected, we are increasingly overrun by the sounds of man.[8]

6. Makes me want to run to the bathroom, too.

7. There's another paradox: even though most soundscape recordists are convinced that we make our surroundings suffer from a deficiency of silence, real silence seems to be a scarce commodity on soundscape recordings, too.

8. Composer Alvin Lucier went to places as far away from human habitation as possible, to be able to record electromagnetic activity in the ionosphere; on these recordings one can hear continuous tones at the upper end of the human hearing range, guiding beacons for air traffic, that may well cover the entire planet, like a web.

"Those remaining places of natural quietude, what we call 'quiet places', are some of our most endangered habitats, in California as well as in the rest of the world. This quiet crisis — the disappearance of quiet places at a startling rate around the world — is the theme we address with this compact disc. We must work now to preserve them or they will soon be gone. As 'in wildness is the preservation of the world', so in the quietude of wilderness, we believe, is the preservation of its very essence."

RECITALS

Recordists frequently refer to their soundscapes as symphonies. Jean C. Roche has set up a collection of "great virtuosos" that one may call recitals, as they mostly focus on one protagonist at a time. It allows him to explore the vocalizations of a limited set of animals in some detail and at some length. This is a genre in its own right. In contrast to sound guides, each highlighted species is allowed plenty of time to make its point; in contrast to soundscapes, the effort lies in selecting rather than editing. It's a sensible concept that works well, at least for me. I find it surprising that I have not seen CDs in the same vein from other soundscapists.

On separate albums Roche features Nightingales, European Warblers, Larks and Thrushes. The Warbler-CD offers an unexpected diversity in the songs that the members of this family sing. The voices are mostly strong and vibrant, sometimes strident, but generally (as with the Blackcap and the Garden Warbler)[9] wonderfully mellifluous and varied. *Larks Ascending* opens with what may be the nicest bird singing on the European continent, the Wood Lark. In an uncommonly pure tone this species sings undulating lines that seem to express a deep melancholy. It also contains over nine minutes of continuous song of a first class warbler, the Skylark. One can hear this bird, visible only as a speck high above European fields, giving out its excited whistles and trills throughout spring.

Apart from the fact that at last one can hear the width and depth of these birds, these albums are especially appealing because the songs have not been placed over a background that was created for that purpose — all tracks do sound natural. As far as I am concerned, pure mono recordings often are to be preferred to heavily edited 'symphonies' in meticulous stereo. On the second track of *A Nocturne of Nightingales* you hear two birds from adjoining territories competing in song.[10] The rivalry and the interaction stand out in the serenity of the night.

Finally Sittelle has brought out two CDs with 'large mammals', *Wailing Wolves* and *Songs from the Deep*. Although Roche does not classify them with the virtuosos, they do belong in the recital category, as only a limited group of species is highlighted. The vocalizations of both wolves and whales consist of elongated glissandi. Choral howls of the former often cross or run almost parallel, making strong difference tones appear. The collection of whale songs may be less unique than the wolves' recordings, this CD[11] contains rarities that make it more than worthwhile. There are the rasping chirps, insistent clicks and high whistles of Belugas. You'll hear the voice of the Narwhal, halfway between sputtery mooing and the bellow of an elephant, after short bursts ending in a plaintive whine or swiftly gliding up the scale to unexpected heights. A Humpback around Hawaii that must have been recorded from a considerable distance, as the water seems to be alive with reverberations of its song. Something you should hear at least once in your life is the incomparable interplay of Bowhead Whales and Bearded Seals that concludes this CD. The deep and slow ascending grumbles of the whales are garlanded with multitudes of faster descending tremolos yelped by the seals in the upper end of the tonal range. There is an outlandish, almost electronic quality about these sounds, something quasi deliberate in how they go together. This planet houses communities that we can perhaps touch and spoil, but that we will never be able to master.

ENJOYMENT

Just like there are different motives for making soundscape recordings, there are different ways of listening to them. I do not always listen as closely as I have for this discussion. Sometimes I will play an album to serve as a background for reading or writing; as there is no musical development or drama, I find that such recordings do not distract me from these activities but rather seem to support them. At times I do listen to soundscape CDs for relaxation, a usage that the makers often promote. For me this does not work with just any album, though. One type of sound that is invariably claimed to put your soul at ease never fails to make me restless — running water. On one hand it involves a lot of movement, on the other hand it drowns a large part of the sound spectrum. I notice that this can make me involuntarily strain my ears to be able to catch signals which may be of importance. Most rainforest recordings, because they contain powerful sounds tightly packed together, have a stimulating rather than a calming effect on me.[12] What's more, generally speaking it is the soundscapes from my part of the world (Europe, that is, rather than the temperate zones of the northern hemisphere) that I find effective in that sense; probably because the total image and most of the details are familiar — they sound close to home.

One example comes to mind of what could be this familiarity at work. After I had listened almost halfway through *Wailing Wolves*, suddenly my hair stood on end and shivers began to run down my spine. Looking at the index I found that the first part with recordings from Canada had finished, and the second part was on now, featuring French animals. This makes me wonder how this CD would affect Canadians, or better still, North American Indians.

Another reason for playing soundscape recordings is to indulge in the sense of fascination that is brought about by the magnificence and the singularity of specific sounds. At times my perception shifts there and back between this wonderment and a strong impression of musicality in the unpredictable variegated patterns, the sonorous and intricate vocalizations. This may be evoked by the sharp percussive gargles of displaying Capercaillies (a large type of grouse) as on Sittelle's *Scandinavian Soundscapes*. These birds produce short phrases of accelerating throaty snaps, alternated with excited rhythmic screeches. On this specific track two males meet and have it out in a thrilling dispute, whilst a Robin (tiny relative of thrushes, not to be confused with its American namesake) interlaces their competition with its imperturbable treble warble. Tropical birds can be eerily melodious.

9. The bird that inspired Olivier Messiaen's piano composition *La Fauvette des Jardins*.

10. A third bird (not noted in the liner notes) is singing in the background.

11. Recorded by the Marine Mammal Fund in San Francisco.

12. I remember Peter Cusack, a British recordist and musician who has worked in Thailand and Malaysia, telling me that nature in Southeast Asia is quite noisy and lively.

The throaty gurgling arpeggios of Oropendolas are a case in point. On the Sittelle CD *American Forests and Lakes* the call of one is followed up with an even more unsettling sound. A wily thin whistle, as if somebody is passing by doing his utmost to appear casual. That is the aptly named Musician Wren, the 'mysterious' bird from Olivier Messiaen's *Et exspecto resurrectionem mortuorum*, reputed to sing only shortly before its death, according to the composer. Messiaen held that birds are the most accomplished musicians of creation. A comparison between music and sounds from nature is readily made. But can or should they be equated; and if so, to what extent? It is something that I want to go into in the last part of this series, in which I will take a look at certain human interpretations and adaptations of the voices that our species has discovered in nature.

LIST OF ALBUMS DISCUSSED IN THIS ARTICLE

RECORDIST/ PRODUCER	TITLE	FORMAT	COMPANY/ LABEL	ID#	NOTES
Storm, Jonathon	River of Ice	Tape	Earthtunes	ET5-1001	
Storm, Jonathon	Ancient Forest - Spring Chorus	CD	Earthtunes	ET5-1004	
Jussi, Fred	Voices of Matsalu	LP	Melodiya	C90-13845-6	deleted
Jussi, Fred	Bird Songs of the Woods 1	LP	Melodiya	C90 23557 008	available through WildSounds
Matzner, Paul	Quiet Places	CD	Oakland Musem	2222222222	
Goodwin, Ray	Gloucester Wildlife Tapestry	Tape	Saydisc	CSDL 304	British ambiance sketches
Bruckert, Remy	Jungles of Borneo	CD	Sittelle	26304	forest and seashore
Herelle, Jean-Luc	Quebec Symphonies	CD	Sittelle	26502	
Lumsdaine, David	Australian Soundscapes	CD	Sittelle	23907	
Marine Mammal Fund	Songs from the Deep	CD	Sittelle	48207	
Matheu, Eloisa	Brazilian Soundscapes	CD	Sittelle	26106	
Mild, Krister	Scandinavian Soundscapes 1	CD	Sittelle	25109	
Roche, Jean C.	American Forests and Lakes	CD	Sittelle	22405	
Roche, Jean C.	Forests and Mountains of Asia	CD	Sittelle	22702	
Roche, Jean C.	Mountain Medley	CD	Sittelle	23501	different vegetation zones
Roche, Jean C.	A Nocturne of Nightingales	CD	Sittelle	43608	
Roche, Jean C.	"Sylvia" Warblers	CD	Sittelle	42205	
Roche, Jean C.	Larks Ascending	CD	Sittelle	42403	
Roche, Jean C.	Birds awakening - 2	CD	Sittelle	24409	
Roche/Bruckert	New Guinea Soundscapes	CD	Sittelle	25505	
Roche/Gaulthier	Forests of Poland	CD	Sittelle	25703	
Roche/Gunn	Wailing Wolves	CD	Sittelle	11102	
Kellogg, Allen, Asch	Sounds of a Tropical Rain Forest	Tape	Folkways	6120	early attempt at soundscape, from 1951!
Gibson, Dan	Solitudes, Sampler Album	CD	Solitudes	CDSDG 84	
Krause, Bernie	Amazon Days, Amazon Nights	CD	Wild Sanctuary	1505 CD	

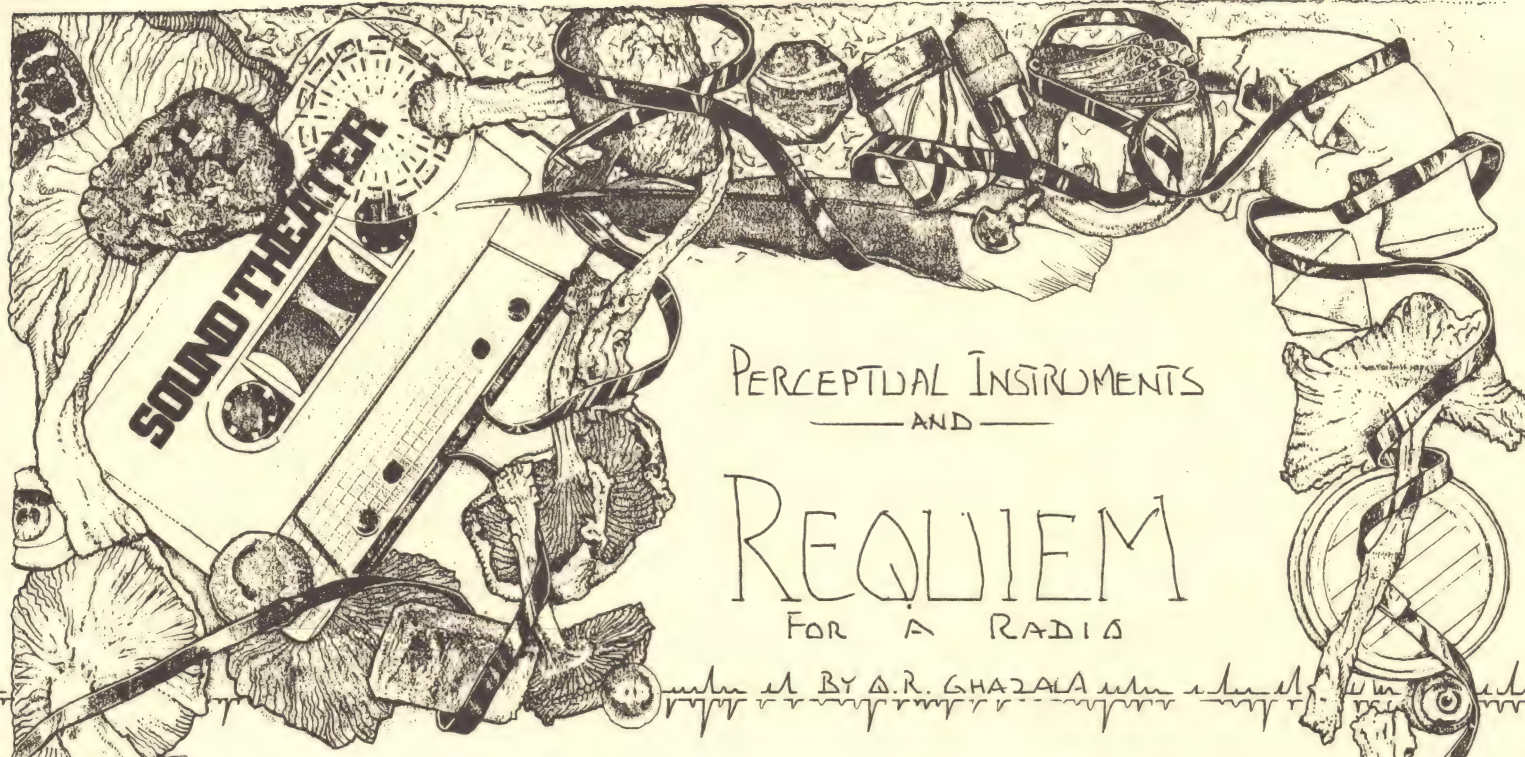
ADDRESSES

Earthtunes, 6190 Beaver Valley Road, Port Ludlow, WA 98365, USA
Oakland Museum/Nature Sounds Society, 1000 Oak Street, Oakland, CA 94607, USA
Saydisc, Chipping Manor, The Chipping, Wotton-under-Edge, Glos. GL12 7AD, UK
Sittelle, rue des Jardins, 38710 Mens, France
Smithsonian/Folkways Mail Order Service, 416 Hungerford Drive, Suite 320, Rockville, MD 20850, USA
Wild Sanctuary, 124 Ninth Avenue, San Francisco, CA 94118, USA

Dan Gibson's **Solitudes** series is distributed by Holborne Distributing Co. Ltd., P.O. Box 309S, Mount Albert, Ontario, L0G 1M0, Canada

Major distribution services for nature sounds recordings are:
The Crow's Nest, 159 Sapsucker Woods Road, Ithaca, NY 14850, USA
WildSounds, P.O. Box 9, Holt, Norfolk NR25 7AW, UK

Major sound archives:
Cornell Lab of Ornithology, 159 Sapsucker Woods Road, Ithaca, NY 14850, USA
National Sound Archives, 29 Exhibition Road, London SW7 2AS, UK



PERCEPTUAL INSTRUMENTS AND REQUIEM FOR A RADIO

BY A.R. GHAZALA

From the program notes of the compact disc, REQUIEM FOR A RADIO:

"A small plastic radio was dramatically transformed into a number of globular sections. These artifacts were distributed to people all around the planet as part of the early Requiem Project.

"Every sound in this recording was initially released by the discarded radio as an evolution was forced upon it. The radio was pried apart, crushed, melted into a disc, and lastly, cut into forty small pieces. Each of the four movements of this requiem are constructed exclusively from the sounds produced by one of these four different actions.

"To celebrate this death and transformation, REQUIEM FOR A RADIO shadows the structure of the classic Requiem Mass in its familiar configuration. Here, however, plastic voices chant free rhythms and saw blades cycle into prayer. From anklet bells at infants' feet, to thunder pounding down the shore ...all is illusory. Fires, surf, rooms of people, none are what they seem. Sound, by metaphor, reconstructed; a painting on the listener's eye, the canvas as a shroud."

Muscae volitantes is a lovely Latin term meaning "flies flying around" ... ...

ARG

Perceptual Instruments and *REQUIEM* FOR A RADIO

By Q.R. Ghazala

(continued from previous page)

This term describes what might otherwise be known as "floaters," the odd spots and squiggles one occasionally sees drifting about in the field of vision. I would like you to know that as I write this, as it has been for the last several weeks, I now have one of these *muscae volitantes* in the shape of an impossible-to-ignore question mark superimposed over everything I see. I am naturally the wondering type, but I find this further incentive to doubt, while healthy, to still be wryly distracting, and I'm uncertain what the cumulative effect has been.

"What is a musical instrument?" boils down to "What is music?"; a subject I don't feel competent to tackle even with a question mark in my eye. But there are some general conclusions that, having shown promise, play strong roles in how I develop certain experimental musical instruments.

To my mind, every sound has an emotional value. Have you ever noticed how different you feel when the sound of the ventilation system clicks off, enabling you to relax into the silence? And it would seem that several sounds together might create an emotional chord of sorts. Again, the curtain rises revealing 'pitch' and 'noise' alike upon the same stage, arrangement tailored to best facilitate the emotions to be stirred.

I can't help but ponder this interplay and its implications in the broadest sense relative to orchestration. If music communicates through the emotions, and non-musical sounds are themselves emotive, an immediate re-thinking of the instrument's role in composition (music?) is suggested. ***Requiem for a Radio*** is based, in part, upon the well-trodden ground of such assumption. This conclusion would have it that everything capable of producing a sound, by itself or when somehow played, is a viable instrument for the production of emotionally charged (your choice) a. music, b. noise, or c. other.

VALKYRIES OF ASGARD
(*KYRIE*)
First Movement: radio is pried apart.

Can the emotional value of a sound go beyond its purely sonic reality? Intriguing territory here, no doubt, relative to instrumentation. If you were composing a piece of (your choice again: a, b, or c) and *it* was meant to illustrate a viewpoint regarding a specific historic event, would you not prefer a sound sample of something directly related to the event (striking the Titanic's prop blades, bowing the Liberty Bell, Sputnik's "beep", etc.) to an accurate replica of the sound? Would you be swayed in your desire to use original sound sources relative to the eventual listener's knowledge (or lack of) as to the origins? Would you make an effort to inform?

What if a concept (often full of events) rather than an event itself were to be examined, and come to bear upon decisions of experimental instrumentation?

Tilting calmly off-axis, the yellow, fire-brick silo cast its growing shadow through the farm's dying oak trees, the sharp darkness stretching across the roadway opposite a failing autumn sun. I pulled the car up toward the silo, amidst the sailing grasshoppers and between the walls of tall green weeds advancing at the gravel driveway's edge. Braced by the unhindered winds that surge over the vast flat croplands of northern Indiana, the fire had leapt to the southeast, from country house to wooden barn to milking sheds. Though adrift and desolate long before the blaze, the small dairy farm had now become three isolated islands of dark jagged rubble amidst an envious sea of watchful grass.

I found myself overwhelmed here by the tantalizing silhouette of time, stretching across the moment like the silo's shadow momentarily unfurled across the road, suddenly in the lap of anyone driving by. A theme of consumption fell over this land. It was not difficult, caught in this hall of mirrors, to see the buildings as they once stood, to hear the cowbells and quiet lowing from out in the meadows. Next to me, revealed only by their rigid handles, a molten heap of milk pails seemed to long for the clatter of earlier days. Found, remembered, lost, sound is very precious. The fire's signature was upon everything, dramatized now by the solar ember nestling itself into the charred timbers of the fallen barn which jutted up, yet a bit longer, above the horizon.

Here, in vivid schematic portrait, we had both microcosm and macrocosm of consumption. Once forest, the trees were felled to provide shelter, tools, and heat, as well as to create meadow lands for the grazing of cattle. The grass was consumed by the cows, their milk consumed by we humans, in a cycle repeated on this parcel until broken, ultimately, by the consuming fire. Leaning over into the crumbling, open foundation of the farmhouse were the very grasses that once fed the cattle. Still, while having gained the barnyard, their widening domain was all the same being consumed by small but spreading trees, descendants of the forest that had once overspread the land. I felt as though this drama was further emphasized by the celestial juncture present. That is, night was approaching, its cool darkness consuming the last light of this warm autumn eve, while the fall season was itself swiftly waning, soon to be displaced by winter's blankets which, if only for a moment, will consume the three islands of charcoal and conceal their enticing incongruities.

Artworks can provide conceptual closure. Elegant summaries in the form of tangible refined themes can be brought forward to help illustrate realizations. Amidst the remains of this dairy farm I had found various artifacts suitable for field recording. My plan was to return to the location and record source material in the form of struck, bowed, rubbed, rattled, swung, walked-upon,

wind-blown, and otherwise activated areas of melted metal and glass, charred wood, piping, stone, and etc. The recordings would then be brought back to the studio to finally be arranged into an audio work consistent with the evocations of the original setting, itself having become the instrument. Alas, I did return with equipment at hand only to find the location, perhaps fittingly, consumed once more. It had this time been razed by the blade of a bulldozer, unrecognizable if not for the sentinel oaks still on watch, if not wearily, by the roadside.

Beyond actual events or locations, broad concepts, barren of immediate artifact, might themselves shape an instrument's design or usage. Following a very difficult period of my life, about a decade ago, I spent a considerable amount of time studying the relationship between philosophy, theology, and peripheral science ...science that only hints at itself, still a brief moment ahead of the scientist's glorious, though irreverent, detectors. A delicate triad indeed. It was during this period that I decided to celebrate the examination of this triad through the creation of an audio, visual, and sculptural artwork. *Requiem for a Radio* was the result.

Painting a complete picture was not my intention for the Requiem Project. The result would have been self-defeating and inaccurate had I tried. Instead, I have grouped a small set of expressive indicia. They're nothing more than an incomplete collection of signposts, very precise, yet in a largely undeciphered language.

Historically, civilizations become known by their art, science, religion, and politics. I needed an instrument and a process through which I could express my concept of this interplay relative to the philosophy/theology/peripheral science triad and our present planet-culture. I chose a non-working, plastic, portable transistor radio, designed in the shape of a battery itself, to serve as the object/instrument, a material metaphor, a sacrificial lamb. The combination of science and art to be addressed as a sounding body, like the usual acoustic instrument, but serving the role of *perceptual instrument* as well ...an instrument in which the perception of connectedness to theme plays a vital role, alongside sonic properties, in choice for usage. Hierarchical politics and religion are addressed here as compositional pressures, again metaphoric, represented in the requiem form, the title references, and by means of the individual movement's mechanical processes (or sculpture/playing techniques: pry, grind, melt, saw).

HYMN FOR THE FACES OF BELMEZ
(*DIES IRIAE*)
Second Movement: radio is fed through ice crusher.

A bow and violin; a saw and plastic radio. While the differences are terribly obvious, so are the similarities.

In 1988, I bought the non-working radio, the instrument/object, the perceptual instrument, at an obscure second-hand shop. I purposely did not photograph it. My desire was to transform this highly-matrixed, representational art object into another art piece, and by means of its own destruction. The result would be a set of molten plastic bodies, swirled in colored waves of paint-crackled contours, sprouting circuitboard components like surreal jellyfish and porcupines. Like dinosaur heads and angels. The process of this demise and resurrection would be performed in stages, each conducted and audio recorded in such a way as to facilitate arrangement into a final Requiem Mass form. Offspring of the radio, the molten bodies are a by-product of the recording, the recording is a by-product of the creation of the bodies. The project considered both aspects of equal importance.

Originally distributed as a very limited edition of less than forty, the first *Requiem for a Radio* release consisted of cassette recording, program booklet, and molten body. A small handful of these bodies remain. They are to be further divided, this time into very small sections, so that they may be visibly entombed within the clear window of a laminated commemorative card to accompany the initial distribution of the new Requiem Project CD. The fragmenting of these remaining bodies will again be recorded for future use, possibly in the setting of the Office Of The Dead (or, the hour of the dead) from a ritual similar ritual to the Requiem Mass, though rarely addressed by composers.

My treatment of the Requiem Mass is an extension of the evolving vernacular of the ceremony's contemporary liturgies. For nearly eight hundred years, the Mass has presented a changing art form. The oldest musical setting known for the Requiem Mass is by Ockeghem (c 1470), though Verdi, Berlioz, and Mozart (finished after his death by F.X. Sussmayer) composed the very individualized versions by which the service is known today. Beyond the Roman Catholic outline, both Mass and Requiem Mass continue to inspire diverse settings. While Brahms' *Ein Deutsches Requiem* was based upon passages from the Lutheran Bible, the English composer Frederick Delius's *A Mass of Life* was influenced by the German philosopher Nietzsche's book *Also Sprach Zarathustra*, completely unrelated to Christianity. The strict interpretation of the Requiem Mass as a plenary mass (or complete mass containing settings from both the Proper and Ordinary) has all but evaporated in many composer's minds so as to make way for more personal readings.

I've chosen four well-known, traditionally sequenced movements to illustrate Requiem for a Radio. These are the Kyrie, Dies Irae, Sanctus, and Agnus Dei. My interpretations are impressionistic, symbolic. These sections are additionally titled since they also serve as parallel portraits, reflections on bits of legend and history, outlined in the Requiem program notes. Briefly, tied to these movements are the Valkyries, who are the handmaidens of the Nordic god, Odin; the Faces of Belmez, an unexplained materialization within a cottage home in southern Spain; the Sea Bishop, a Chinese demon that heralded devastating storms; and the Egyptian Altar of the Sun, to which the phoenix flew. Regarding sound production of the object/instrument within these movements, from the program notes:

VALKYRIES OF ASGARD (Kyrie)

A recording microphone was attached to the radio. Ignoring the screws, the radio was then pried apart, all the contents being removed by force. Restructured sounds of this procedure com-

bine to create the first movement in this requiem. Within the hesitant stereo bloom, wooden notes rise between the flying shards of plastic. Layers thicken; soft voices become abrupt shouts...

HYMN FOR THE FACES OF BELMEZ (Dies Irae)

In this section the microphone was affixed to a powerful electronic ice crusher. The machine labors and binds as the fragments of the radio are digested; a distant struggle is sounded while the predominant frequencies of the motor are brought forward to create the hymn-like textures. Images of a macabre dance emerge from the stumbling mechanics. ...The uneasy, violent consumption of the radio in this movement reflects the essence of the Dies Irae, or Day of Wrath.

SONG OF THE SEA BISHOP (Sanctus)

In this third movement, crushed pieces of the radio are heard being thrown into the metal container in which they are to be cremated. Screws roll in circles, arcs of plastic rock back and forth, circular objects settle like spinning coins awaiting dead eyes. As these sounds are reshaped, the listener is slowly led through a great tempest...

ASHES ON THE ALTAR OF THE SUN (Agnus Dei)

The melted radio is now sawed and broken into the final artifacts of its resurrection, the small molten chunks that were distributed as part of the original Requiem Project. This movement, a closing orison, suggests transition-in-waiting and the reverence that accommodates benevolent mystery. Muffled talking, abstract laughter, and waves of foreign syllables condense the rituals of life...

Processing of the initial sounds was limited to EQ, reverb, pitch change, and rarely, reversal. As with much music ...traditional, electronic, *musique concrete*... the recording studio can become a strong experimental instrument itself. Diminutive sounds can grow thunderous; high-pitched sounds reborn as deep rumbles. With careful attention, any sound can be made to represent almost any other sound. While much of the Requiem recording is rather straight-forward, all movements contain highly illusory sound-forms, all created from the noises of the radio's transformation.

Does a process *create* an instrument? Is the bicycle wheel not a musical instrument until the spokes are struck? Is it even then a musical instrument? Is the violin not a musical instrument until touched with the bow? Is the *process* the musical instrument, ourselves and the sounding bodies merely secondary agents? Is the *thought* behind the process the real instrument? Perhaps the *act of composition* is the true experimental instrument, and instruments as we've grown to expect them are really no more instruments than the isolated string of the piano, in good company but still alone, the elephant's tail in a blind man's hand. I better stop, lest my *muscae volitantes* get the best of me.

Requiem for a Radio is meant to inspire wonder, criticism, doubt. It is not an examination of any single learning or belief, but rather a broad work of epistemology, a study of the nature and limitations of humankind's knowledge. It is meant to address problems in visual art and music, as well as in the prevailing phenomenology of a species. A radio? Molten bodies? The title references? A requiem? The recording is a riddle. Not of my own making, but only of my own arrangement. Abstruse, yet inclusive ...and certainly unanswered.

Again, quoting from the program notes:

"This modern requiem seeks to unite aesthetics often believed to stand in opposition. Do science and theology truly lie so far apart? There is a notion that peace is a product of perception. As music, sculpture, and restless theater, *Requiem for a Radio* continues to ask its questions."

SONG OF THE SEA BISHOP
(*SANCTUS*)
Third Movement: radio is melted.

ASHES ON THE ALTAR OF THE SUN
(*AGNUS DEI*)
Fourth Movement:melted radio is sawed apart.

Reed Ghazala's *Requiem for a Radio* CD, soon to be followed by *Threnody to the New Victims of Hiroshima*, performed on the Vox Insecta instrument, is available from REALIZATION RECORDINGS, 9452 Telephone Rd. 116, Ventura CA 93004, USA.

Reed can be contacted through:SOUND THEATER, Echo 241, 7672 Montgomery Rd., Cincinnati OH 45236, USA.

—A Special Note From Reed—

CALLING ALL CIRCUIT-BENDERS! I am considering the possibility of creating a unique boxed set of documentation dedicated to the subject of experimental musical instruments and experimental music created by the re-wiring of standard audio circuits. To illustrate the unusual sounds, construction, and playing techniques of 'circuit-bending', a book/CD/video package is now in discussion. My feeling is that the project should take the form of an eclectic gallery featuring the instruments of various builders worldwide. The success of this endeavor will therefore highly depend upon the contributors' input. While every little bit of information will be appreciated, I would especially encourage designers to send a package consisting of photos, recordings, written opinions, personal portrait, and video, if possible, of the instrument(s) in use. Please send materials that may be kept on file to Reed Ghazala at the Sound Theater address listed above.

BAMBOO The Giant Musical Grass

By Richard Waters

Part 3

WORKING BAMBOO: TOOLS AND METHODS AND A SOUND DEVICE

This is the last of three articles on bamboo by Richard Waters, instrument maker and bamboo cultivator. In the first part, appearing in EMI's March 1995 issue (Volume 10 #3), Richard discussed bamboo species and their characteristics. In the second installment (Volume 10 #4, June 1995) he covered bamboo cultivation. In this third part, Richard focuses on tools and methods for working bamboo, then describes a set of his bamboo instruments of his own recent creation.

If you have been following along in this series of bamboo articles, by now you will have gathered and cured a supply of bamboo culms and are ready to go to work. What tools to use?

First, you will need saws — electric and/or manual. They must be sharp and have fine teeth, as coarse-tooth saws will splinter the cuts. I use a saber saw with a long blade for cleaning up the branch stubs and for cutting the culm into sections. A hack saw will also work well for this, as will the Japanese saws or fine tooth American hand saws. Circular saws with a fine-tooth blade will also work for cutting the culms but are difficult to use for de-branching. A table-mounted belt sander with a medium-grit paper works well to round out and smooth the edges of the cuts but this could also be done with a sharp knife or a hand rasp or sand paper.

If you want to remove the inside nodes* of the bamboo so that you will have a long section of bamboo without blockages, you will need a piece of pipe or other round metal tube that you can use as a ram to knock out the nodes from the inside. This piece of pipe should be just a little smaller than the inside diameter of the culm you are working. Usually, several blows will shatter the node. You can then shake out the loose particles and then go on to the next node.

Some bamboo projects require splitting the culms, which is easy to do. A large knife like a combat knife or small machete or flat hatchet will do. Place one end of the bamboo culm on the floor. Position the knife on the top end at the point you wish to split. Take a hammer and strike the top of the knife, which will open the split. If you want to split the culm all the way, keep on tapping. Bamboo lends itself very well to this type of manual splitting.

At least one good carving knife will be required to finish and shape your final project. This knife should be razor sharp and be able to hold an edge. High carbon steel blades like those from Northern Europe seem to be the best. An X-acto set of carving blades can be put to good use for fine work.

Holes cut into bamboo with a standard twist drill bit will frequently splinter the bottom side of the cut. To avoid this, invest in a small set of Forstner bits, which will give you very clean holes if you go slowly and do not overly pressure the bit as it cuts the hole. Do not use spade bits as they have a tendency to split the culms. For under an inch in diameter, such as tone holes, get a set of bits that start at 1/4 inch or less and graduate to one inch, as these will be the sizes you will use the most. (For an alternate way of making holes in bamboo see the article "Wind Instrument Toneholes" in *EMI* Volume VIII #4.)

Binding is the traditional way of reinforcing bamboo. A minimal amount of knot tying is required — mostly half hitches and granny or overhand knots. I usually start with a slip knot backed up by a overhand knot. I follow this first loop with two or three half hitches. Each step of the binding is pulled extremely tight so that the cord actually reinforces the bamboo against splitting. After the last half hitch, I tie one last overhand knot to keep the half hitches tight. Though non-traditional, Dacron seems to be one of the better cords to use with bamboo. It is resistant to moisture and ultra violet, and is easily available. A step up is the net twine that fishermen use, which is waxed or treated. For synthetic cords, seal the ends to avoid fraying by burning with a lighter, match, or candle.

Weathering: As a general rule bamboo products that are exposed to weather will check or crack. Binding with cord will reduce but not eliminate this problem. It is suggested that finished products not be exposed directly to sun and moisture (see the discussion of preserving in part 2 of this series). If you need to expose bamboo to the elements, epoxy reinforced with chopped fibers or a small piece of matte/cloth is a way to secure the open ends and nodes. Bamboo wind blocks or chimes that live outdoors may be hung under eaves, on porches or in a breezeway to provide some protection. It may be possible to construct some sort of aerodynamic roof into the instrument design to shield the bamboo from the elements.

The Bamboo Project:
THE BAMBOO AEOLIAN DEVICE = (BAD)

I have long had an interest in aeolian harps and other wind-related ideas. In the past I have siliconed different-sized throw-away glass bottles together, and hung them in the wind. Designing and building a wind flute seemed like a logical extension of this, and bamboo naturally provides to the multiple resonant chambers that would be needed. I had read in David Farrelly's publication *The Book of Bamboo* (Sierra Press — about $20) that some villages in southeast Asia use bamboo groves as part of the village defense. The grove is de-branched under ten feet or so to give the prevailing

*The node of bamboo is different than a sound node. A bamboo node is the joint in the culm where two sections meet.

PHOTO# 1, FACING PAGE: This was the author's first effort. Each section of each culm has a tone hole, so there are about 36 tone holes in all. The longest piece is about 3 ft. long and 2" in diameter. All are Phyllostachys. The coloration is from smoking with a torch.

PHOTO #2, UPPER LEFT: Horizontal wind flute. Black bamboo, 3/4" - 1" in diameter by 2' long.

PHOTO #3A, CENTER LEFT: Vertically-suspended culms between horizontal ones mounted at nodal points for percussion as well as aerophonic sounds.

PHOTO #3b, LOWER LEFT: Detail of the same instrument, showing tone holes.

PHOTO #4, UPPER RIGHT: The two horizontal culms have three tone holes each. The three vertical ones are for percussion only.

PHOTO #5, CENTER RIGHT: Another arrangement for horizontal and vertical culms.

TURN TO PAGE 32 FOR MORE PHOTOS.

wind an unobstructed path to the tone holes, which are cut or burned into the culm sections on the windward sides. The howling of these holes is supposed to deter invaders and wild animals, etc.. I have since heard a hauntingly subtle but similar sound coming from metal scaffolding that had small holes (1/8" - 1/4" dia.) in the tubing. This prompted me to make an aeolian flute (wind flute) in combination with a large bamboo wind chime. This combination I call BAD for *bamboo aeolian device*. The reason for constructing a suspended BAD instead of a ground- or base-mounted model was to get it up in the air and away from ground turbulence and wind shadows. For a BAD or wind flute, site is almost as important as design.

For my first BAD (photo 1) I used culms in the 1-2 inch diameter range and from 18 to 30 inches long, each of which had several nodes. I drilled holes of different diameters at the bottom of each node and offset these on the diameter so that the holes were not all in line on the same side. To my surprise it actually worked quite well. There were no long tones though, as the wind would make the holes sing, and then the piece of bamboo would turn and stop that hole from singing as others holes would start. This created breathy melody lines or phrases within a prevailing random non-rhythm of the culms striking each other. From thirty feet away the overall sound from the BAD no. 1 was like water dropping into a pool, which I thought a little amazing. The multiple start/stop wind flute sound in combination with the percussive sound of the large chunks of bamboo colliding was interesting, but I felt I would like to create a flute sound that would have more of a sustain. I wanted to reduce the movement enough to do this, which led me to consider adding some sort of foil or wing, or some other design change that would aim the tone holes into the wind.

Following this first idea I tried a series of horizontal, suspended wind flutes with foils connected to the outside ends. To do this I epoxied an inch or so of hardwood dowels into the open ends of the bamboo so I would have something solid to hang the foils from. The foils had to be enormous to compensate for the amount to bamboo surface (plus tone holes) presented to the wind. There was the additional problem that the bamboo was so light that the wind would lift it and change the angle relationship of the wind to the tone holes, so I had to think about either making the wind flute much heavier or tying it off via the ends to the ground as well as above. In order to keep moisture from the tone holes the pieces of bamboo were mounted with the tone holes at or close to the bottom, facing the ground, sometimes in a straight line or offset a little side to side. This way, if the piece revolved 90 or 180 degrees there would still be holes facing into the wind. The most successful of these were multi-directional, but all on one plane, horizontally hung, wind flutes without foils. (See photo 2.)

After making this series of horizontal hanging wind flutes I decided to try a double vertical one where the wind would be funneled between the two pieces of bamboo, thereby condensing/increasing the velocity of the wind. I cut the tone holes at the very bottom of each node so that water would not collect in the interior. Fastening the two culms together with an aluminum roof section and a base section which acted as supports for the vertical aluminum foil that orients the wind flute into the wind. The vertical flutes also worked better as there was less leverage on the outsides which caused the horizontal flutes to vacillate. This was more successful and yet even the small amount of movement of the wind flute created stop and start tones. By sitting behind the wind flute and holding the foil I could "tune" the flute more accurately into the wind so as to hold the tones longer. As the two vertical pieces of bamboo are mounted with eyebolts at top and bottom, each piece of bamboo may be manually rotated so as to change the angle of attack of the wind.

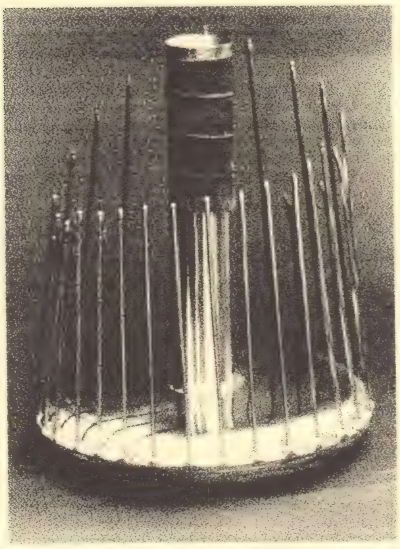
Next I made a series of horizontal flute sections hung like marimba bars in combination with vertical culm sections that struck them and each other (see photos 3, 4 & 5). I also made an all-vertical black bamboo BAD with a central large, long culm with tone holes cut into the bottom of each node on different sides, so that no matter which side was facing the wind something would be singing (photo 6). This group of BADs (photos 3-6) seemed to me the most successful both in an audio and visual sense. At this time I also constructed a percussion device using Black bamboo (Phyllostachys nigra) suspended from some Buddha Belly bamboo (Bambusa ventricosa) (photo 7). Most of the bamboo utilized in all of these designs were from the Phyllostachys genus — primarily P. bambusoides, P. henon, and P. nigra, though many other species in this genus work just as well. As the genus Bambusa has thick walls which do not lend themselves to cutting flute-type tone holes I did not utilize this genus of bamboo for sound producers. (See part 1 of this series of articles for detailed descriptions of varieties of bamboo.)

I am not a purist in terms of materials. For instance, I occasionally use epoxy to re-enforce those places where I am attaching hardware. (Stainless steel hose clamps are also good.) And although I could be making the Aeolian Flute from PVC plastic, which would last a lot longer in the elements, I enjoy the working of bamboo so much more than the working of plastics that I have yet to try one from PVC or ABS plastic. I can't grow plastics, plus I have to haul plastics away when they start breaking down, which they do in sunlight. Bamboo can be composted or burned as kindling. It is the most versatile material I have ever used. Besides that, it is a beautiful plant, and you can eat it (thank you Mother/Father Nature). It is an optimum material for artists and crafts people, especially for realizing wind, string and percussion instruments and sound devices. This plus the fact that it is a "cut and come again" crop that you can easily grow yourself in a relatively short time in your backyard makes it an ideal material. Viva Bamboo!

For bamboo questions on-line contact: Bamboomuse@aol.com

PHOTO # 6, LEFT:
The long, central culm has toneholes on different sides at the bottom of each section.

PHOTO #7, ABOVE:
A hand-played bamboo percussion piece.



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RAMBLINGS

from Bart Hopkin, EMI's editor

This is the second edition of this "Ramblings" column. Actually, the first edition appeared under the name "Miscellany" — upon later reconsideration, I decided to change the name. The column will be appearing in *EMI* either on a regular basis or on a sporadic basis (time will tell). As I said in the last issue, the column will cover various topics from my own explorations in musical instrument construction. Today's subject: Events per second.

Almost all musical instrument sounds come about through natural oscillation based in the springy or elastic qualities in vibrating bodies.Something is stretched or compressed or bent relative to its natural rest position, and then allowed to spring back (picture a musical string being plucked). It then rapidly flexes back and forth, creating the vibration. If nothing happens to impart more energy into the system, the vibration gradually dies down. This sort of mechanism applies not only to strings, but to membranes, plucked prongs, and even, though it's harder to picture, to wind instruments (in which the elastically compressible qualities of the enclosed air play the crucial role).* You could almost say that the art of musical instrument design, at the most basic level, reduces to this: dreaming up such mechanisms of oscillation and finding convenient ways to let them do their thing. Natural vibratory motion of this sort usually leads to a sound that strikes the ear as pleasant and musical.

OK, then, just to be perverse, let me pose the opposite question. What are the prospects for instrument designs in which you deliberately *don't* encourage this sort of natural oscillation? What if you take the approach, instead, of using an external mechanism to *force* a vibratory motion, in patterns of movement determined not by natural flexing motions, but rather by the mechanics of the driver?

The simplest way that I can think of to do this is to drag a stick over a ridged surface. With this mechanism, the stick bumps from ridge to ridge in what amounts to a rapid vibration. Although there might be a bit of springy-flexy motion in the stick, the main thing determining the stick's pattern of movement is the shape of the ridges and the way in which the tip of the stick rides over them.

I managed to get hold of a large piece of rubber mat, originally made to be laid along a walkway to provide a no-slip walking surface. The surface on one side of this mat has parallel lateral ridges, about an eight inch apart. If you drag a stick over the ridged surface at a speed of, say, twenty inches per second, then the stick will be bumping over the ridges at a rate of

[8 ridges/inch] * [20 inches/second] = 160 bumps per second.

Do you then hear the pitch associated with 160Hz? (That pitch happens to be a little lower than E below middle C.) Yes, you do — or, yes, you would, if anyone could actually drag the stick at the required uniform speed. Since the human stick dragger's speed inevitably varies, what you actually hear is a varying pitch corresponding to the wavering of the drag speed.

It's tempting to think that the sound comes from the stick repeatedly striking the mat as it bumps from one ridge to the next. And that is a part of the sound. But the major part is that of the body of the stick moving rapidly back and forth, at 160 cycles per second (or whatever), as a result of the ridge-jumping action. The surface of the stick drives the surrounding air like a soundboard. You can demonstrate this by trying sticks with identical tips, but varying amounts of surface area: sticks with larger surface areas make better soundboards, and so produce a louder sound.

I tried dragging various things across my section of ridged mat, and eventually came up with a very efficient assembly to serve as drag-stick/sound-radiator. It consists of a styrofoam cup with a plectrum cut from aluminum flashing glued to the base and protruding to the side (see the photo, following page). Hot glue from a glue gun makes an adequate joint. The player drags the plectrum over the ridges, causing the cup/radiator to jump with each bump of the plectrum.The styrofoam is very light, yet rigid enough to communicate the bumping action to the surrounding air very effectively. The result is great volume, for mid- and upper-range frequencies at least. (Better bass response would require a larger radiating surface.)

This in itself makes a pretty cool instrument. Take two cup-plectra (one for each hand) and a section of ridged mat, add one inventive performer, and you can get a wonderful range of raunchy, suggestive, conversational, insinuating, itchy, irritating, lyrical sounds. (I'll say more about tone quality later.) But in experimenting with this mechanism, I was also interested in the possiblities for a more controlled instrument, capable of producing definite pitches. To produce a single definite pitch, you need a way to guarantee that the stick scrapes over the ridges at a uniform speed, producing a uniform number of bumps per second. To produce a *range* of definite pitches, you need some way to vary this bumps-per-second value.

The photograph on the following page shows the arrangement I came up with for the purpose. The heart of the instrument is a set of disks, a half inch thick and graduated in diameter, mounted on a spindle.The 1/2" wide, exposed outer surface of each disk is wrapped in a strip of the ridged rubber.A motor with a speed control turns the spindle at a constant speed.The player need only hold a plectrum-cup steady against ridged surface of one of the disks as it rotates to get a contant number of bumps-per-second and hear the corresponding pitch. The frequency produced by a given disk will be

[rotations per second] * [number of ridges around the perimeter].

The larger the disk, the more ridges around the perimeter.Yet all the disks have the same number of rotations per second, since they all turn together on the spindle. Thus, the larger disks will produce higher pitches, as more ridges "go by" in the same amount of time. For instance: Imagine that the spindle turns at a rate of two rotations per second, as shown on the chart overleaf. Imagine that one of the smaller disks is of such a size that there are 50 ridges

*Even most analog electronic instruments are based in such mechanisms,, as the movement of electrons in the frequency generataers that provide the raw material typically involves a similar bounding-back-and-forth sort of action. Digitally based systems, however, operate on different principles.

ABOVE: The rotary rasp (someday I'll think of a better name). Plywood disks of graduated sizes are mounted on a spindle. The edges of the disks are covered with strips of ridged rubber matting. An electric motor, with belt and pulleys to drive the spindle, are within the casing. The speed control can be seen lower left. The bent bar crossing in from of the disks provides support for the player's hands holding the plectra.

BELOW :Two sets of plectrum/radiators for the rotary rasp. The ones on the left use plectra of aluminum to produce a harsh, loud tone. The pair on the right use plastic cut from a milk jug for a gentler tone.

around its circumference. Imagine that one of the larger disks has 200 ridges. Holding the plectrum-cup steady against these disks as they turn at one rotation per second will produce, respectively, a lower note at 100 cycles per second and a higher note at 400 cycles per second.

Sample Disk Size	Number of Ridges on Disk	Spindle Rotation Speed	Resulting Pitch
Small	50	2 rpm	100 Hz
Large	200	2 rpm	400Hz

To produce a scale, you size the disks so that the frequency ratios of the desired scale are reproduced in the ratios of the numbers of ridges around the perimeter of each disk.If you're interested in more mathematical details on scale-making for the disks, see the sidebar on the following page.Suffice it to say here that, by carefully sizing the disks so that each one had room for just the right number of ridges around the perimenter, I was able to make and mount a set of twenty-nine disks comprising two octaves and a third of standard chromatic scale.

While the ridge number ratios between the disks determine the intervals that make up the available scale, the ridge numbers alone do not determine the actual sounding pitches. The sounding pitches depend upon ridge numbers *and* the speed of rotation. By having a speed control on the motor that turns the spindle, I made my instrument tunable.Tunable, that is, in the limited sense that while the speed control knob will not vary the intervals between the disks, it will allow you to raise or lower them all as a group.

Briefly, a couple more design notes: I found it helpful in performance to have a guide bar crossing close to and in front of the turning disks, something like the fence on a woodturner's lathe, to provide stability for the player's hand. I also found that different plectra produce very different tone qualities, making it worthwhile to keep a variety of plectra on hand to choose from.Plectra cut from various available plastics (milk jugs, dishsoap containers) produce quieter and less harsh sounds than the aluminum flashing suggested earlier.Varying the size and shape of the styrofoam radiator likewise has its effects.*

I've been discussing the mechanics here, and I haven't said much about the musical qualities of this instrument. The tone, let me say from the start, is extraordinarily harsh. A brief anecdote will illustrate: Somehow I was recently asked to play at a folk music festival with a group consisting, improbably, of a mixture of bluegrass musicians and experimental instrument makers. Our performance went well, and the sponsoring folk music society asked us to come back and play again ... on one condition. That we leave the rotary rasp at home.

The harsh tone derives mainly from the nature of the wave form that the instrument generates. In place of the smooth oscillation characteristic of most musical instruments, the vibratory movement we get here is angular and jerky as the plectrum jumps from one ridge to the next, yielding a correspondingly angular wave form. If the plectrum were to track the rise and fall of the ridges closely, then the wave form would correspond to the ridge shape. The situation would be analogous to the hammond organ discussed in the footnote below, and one could imagine instruments designed with specific ridge shapes for specific tone qualities. But the actual situtation is cruder than that. Rather than close tracking, we have a jump-and-bump action which probably produces something pretty close to a sawtooth wave form. The resulting harmonics are *very* strong. With a softer plectrum (flexibel plastic instead of aluminum flashing material) the plectrum motion and resulting wave form become less angular, making the tone less harsh (also quieter). In addition — this turns out to be pretty cool — you can modulate the tone quality by altering the angle at which the plectrum rides over the ridges. A tilt of the plectrum will bring a new set of harmonics and phase relationships to the fore.The effect is reminiscent of the best/worst sort of post-Hendrix highly distorted electric guitar playing. Sub-harmonics often appear, typically an octave or twelfth below the intended fundamental, sometimes with the fundamental entirely disappearing. This happens when the

*Il can follow my earlier footnote with another observation on electronic instruments. The closest relative to this rotary rasp design that I can think of is the Hammond Organ, and its conceptual predecessor, the Telharmonium. Within the Hammond Organ are steel disks rotating on a spindle near electromagnets. The disks are not truly circular, but are wavy around the periphery. As the disks rotate, the protruding and indented portions move through the magnetic field. This induces an alternating current, with the frequency determined by the number of protrusions passing per second, and the wave form corresponding to the shape of the protrusions. The alternating current is sent to an amlifier, and the amplified signal is sent to speakers to generate the sound.

In the isterest of producing a pleasng musical tone, and one well suited to additive synthesis, the protrusions on the disks in the Hammond Organ have a smooth, wavy shape, replicating a sine wave. If they wished, the makers could instead have induced square waves, saw-tooth waves, or stranger forms, simply by using different disk periphery shapes. Thus, the Hammond Organ is one of relatively few good examples (along with the rotary rasp described in this column) of an analog musical instrument that is not based in the natural, springy sort of oscillation described in the opening paragraphs, but rather on the mechanics of some other sort of driver.

player plays with less pressure, so that the plectrum jump back rapidly enough to catch the next ridge, striking instead every second ridge or every third ridge.

This article has gone on longer than I had intended, and I keep thinking of more observations to add. But I'll stop here.Have I spun off too much into technical detail and lost some of my readership? Forgive me if I have, because it really is an outrageously fun instrument, both in its sound and in its workings, and I've enjoyed talking about it.

SCALE MAKING ON THE ROTATING DISKS

The interval between any two musical pitches is a function of the ratio between their frequencies. Thus, building a scale is a matter of establishing a set of frequency ratios. With the rotating disk, the frequency ratios available on the completed instrument will correspond to the ratio of the ridge numbers on the disks. As an example, consider the very common pentatonicscale with degrees at these frequency ratios: 1:1, 9:8, 5:4, 3:2. 5:3, 2:1. To achieve this scale, we can start by thinking of the smallest disk, with some number of ridges *n*. That disk will serve as the reference tone 1:1. Then the second disk should be made just enough larger to accomodate 9/8 * *n* ridges. The third should be large enough for 5/4 * *n* ridges, and so forth. The sixth disk, producing the octave above, will be twice the diameter of the first, with room for 2*n* ridges.

But notice a problem here. What if 9/8 * *n* turns out to be a fractional number? For instance, if the first disk has 50 ridges, then the second should have 9/8 * 50 = 56 ¼ ridges. You can't very well have a quarter of a ridge in there. Take your pick between two solutions: 1) Choose *n*, your reference disk ridge number, such that you can achieve the desired tuning with whole numbers of ridges. For the above scale, for example, you could set *n* = 48, yielding ridge numbers of 48, 54, 60, 72, 80, 96. 2) Round off the ridge numbers to the nearest whole number and accept some slight mis-tuning. If the ridge numbers are reasonably large to begin with, the mis-tuning will not be large.

If you're interested in an equal temperament rather than a ratio-based just tuning such as the above, then the number of ridges on each disk will need to be greater than the previous disk by the scale factor for the chosen equal temperament. For 12-tone equal temperament (which is standard on most western musical instruments, and to which I tuned the one I made), the scale factor is an irrational number which rounds off to 1.05946. With this factor it is inevitable that you will come up with ridge numbers that are not whole numbers, so you will need to round off to the nearest whole number (option #2 above).

Sizing each disk just right to accomodate a particular number of ridges is a chore. When I undertook the task, I set up a jig which allowed me to sand the disks down uniformly around the perimeter, a tiny bit at a time, so as to preserve the circular shape. I cut a strip of matting for each disk in advance, then cut a slightly oversized disk and sanded it down, checking the fit of the pre-cut matting strip frequently as I proceded, until I arrived at a good fit.

RECORDINGS REVIEWS

By Ernie Althoff and René van Peer

TOM DJLL: **MUTOOTATOR**

On CD from Soul On Rice Prods, 2312 Spaulding Ave., Berkeley, CA 94705 (SRPD 01)

As levels of radiation rise, so do numbers of mutations. Transformation, manipulated alienation is fast becoming stock in trade. Messages that have been subject to an unknown degree of warping spark down the hotwire highway. Hands jolt in static. The mind's a-hum. Threatening though the tools of technology may be in the hands of governments and corporations, when handled by Tom Djll and the like they may spark off exhilaration.

This CD consists of twenty duets with Djll playing trumpet and Serge-electronics (in conjunction an analog/digital processing unit) vis-à-vis several musicians and one poet from the San Francisco improv scene. This sound constructor and his construction get coupled to guitarist Myles Boisen, drummer William Winant, cellist Doug Carroll, Tom Nunn on his beautiful self-built percussion boards and guitarist/vocalist Hillary Double-D — to name only a few of the contributors. The Mutootator sounds as if it chews different input into a heterogeneous aromatic cud that changes its sonic appearance with every grind. At times the trumpet shines through worn away layers, but then that is also peeled off and a weird mutation remains. The consecutive tracks take you on a ride that is sometimes bumpy and jerky in the crooks, then soars high in exquisite tension, to be carried into a quiet contemplative respite by Hillary Double-D's gentle voice; only temporarily, the next piece hurls you along again to an uncertain destination. This extraordinary work is one of those rarities that get more intriguing at every hearing. I sure would love to hear Djll in concert.

—RvP

MIYA MASAOKA: **COMPOSITIONS IMPROVISATIONS**

On CD from Asian Improv Records AIR00014

Miya Masaoka's *Compositions Improvisations* is a collection of pieces for 21 string koto — one of the few CDs with such instrumentation that isn't called something poetic in nature derived imagery. This seems to be indicative of Ms. Masaoka's position as to the tradition where the instrument and its music come from. These pieces make clear that she does not (want to) deny its history, but rather has built her own styles and techniques on those grounds. Her music sounds (and **is**) contemporary without stretching the line that attaches the koto to its past too far which I feel is quite different from applying Western musical ingredients, such as simple fixed metre or rows of dissonant chords, as has been done by others.

She takes issues that she feels strongly about as starting point for her pieces. *Hope in the Afternoon* is dedicated to a friend of hers who died of AIDS; *Topaz Refractions* was inspired by a trip to the former location of a Second World War internment camp for Americans with a Japanese background, where her mother had been imprisoned. The former is based on a motif by Cecil Taylor; *Come Sunday* is a piece that Duke Ellington wrote for Mahalia Jackson.

With her approach she has created her own space. And in this space she can make her instrument stand out with delicacy and brilliance. Sonorities and resonance have full play. She is a master of the ephemeral fragility that is characteristic of the koto, making tones evaporate as fragrance into thin air. This finds a natural balance in more robust attacks on the strings and gritty arpeggios. All these aspects (ancient vs. modern, traditional vs. extended techniques, composition vs. improvisation) might in other musicians give the impression of being opposites, the emphasis on one side of each. Masaoka has integrated these. So, even when the motivation of her music is distress and deep sorrow, the music itself is a natural and balanced whole.

—RvP

XIAOYONG CHEN AND HUIHONG OU:
ORCHIDEE — TRADITIONAL CHINESE ZHENG AND QIN MUSIC

Wergo spectrum SM 1603-2 281 603-2 (Compact disc) 1992, WERGO Records, Mainz, Germany.

One of the advantages of digital recording technology and reproduction via compact discs is that low-volume and delicate sounds can be accurately (and beautifully) recorded and reproduced with every sonic nuance in place. Thus it is fortuitous that the delicate sounds of the *qin*, an instrument known in its present form in China for over 1700 years, is combined with such recent science.

"Orchidee" features six tracks of the seven-string, zither-like *qin*, interspersed with a further seven tracks of the 21-string *zheng*, a close relative. The programming function of CD players lets one easily separate the two should one wish. The 20-page booklet presents clear photographs of both instruments and playing positions, biographies of *qin* player Xiaoyong Chen and *zheng* player Huihong Ou (both resident in Germany since the 80s), and two essays. The essays and biographies are in both German and English. The music titles on the back cover are in German only, but are labeled *zheng* and *qin* respectively, so it's still quite clear.

The first essay, titled "The links between Chinese traditional music and cosmos — an introduction", deals with aspects of yin and yang and the five development phases constituting the cosmic cycle, and the second essay describes the two instruments their common origins, their repertoires and their societal roles. Mitchell Clark's article describes the qin as a personal, intimate instrument. It is interesting to compare how the *qin* was "...looked upon as the instrument for the educated upper class..." with a special notation developed for it; and the *zheng* became a common instrument in the folk tradition, with no special notation and compositions being passed orally through the generations. The *zheng* is still played in China today, but *qin* music is rarely heard.

A good illustration of how quiet the *qin* is comes from its comparison with the *zheng*. With one's hi-fi amp set at a 'reasonable' level for the *zheng* tracks, a great deal more concentration is required to hear the *qin*'s music. Walking into the kitchen to make a cup of coffee all but obliterates it. Referring again to the Clark article, the gentle sounds of the plucked *qin* strings on this

CD certainly assist one to imagine the sounds from an aeolian *qin* as being "extremely faint".

Expert playing from both musicians brings out the potential and range of expression of both instruments, and a distinct feeling for the differences between the two instrument/repertoire combinations emerges.

—EA

SUGARCONNECTION: **PLAYS ALIEN CAKES**

On CD from Recommended No Man's Land (nml 9420cd); distributed in North America through Wayside Music and Forced Exposure

What would alien cakes be like? My guess would be that they are sweet, but composed of a crazy combination of ingredients. And suppose these aliens think that a cake is a sonic concoction, then there you are, that is how this CD sounds. Sugarconnection (Anna Homler from the USA, Axel Otto and Frank Schulte from Germany) uses both usual and unusual sound sources to shape "songlines, noisetales and dreamscapes," as is stated on the inlay to the album. The pieces are indeed narrative and emotive, but in a deeply surreal sense. Otto and Schulte support Homler's light-hearted and sensual jabbering with looped samples of a string ensemble and a crackling record locked in a groove, with hoots and quacks from gamecalls, by handling "plastic, metal & woods."

There is a hint of Bolero. Homler's colleague David Moss fades in and out. Canaries perform their gargling capers while squeezed toys squeak, a man says, "that's normal," and a woman responds in a gasp, "my god, now the sun disappears." An orchestra awaits the start of a rehearsal in a buzzy tumult, the conductor calls out in a voice that oozes arrogant formality, "good morning gentlemen, if you please," hush-hush all around, and a forties ball room jazz band strikes up a tune — accelerating initially and then slowing down to thumps, rasps and scratches. Again the needle finds itself caught in a locked groove, the motor is switched off. Another piece plays upon the idea of talking dolls. The familiar lines, "I am tired," "I have to do wee-wee," "I like you," are pronounced in typical cardboard voices. Sugarconnection presents a couple of them engaged in a dialog (in German) that carries particularly saucy and randy overtones, but sounds totally abstracted at the same time because of mindless repetitions. Together they throw the components (extracted from records, tapes and sampler; produced with voice, toys and objects) into molds. These they may fill with sustained tones and chords from a synthesizer, that lends the concoctions a lusciously soft luster. Let them cool down, turn them around, taste the morsels silently with your ears — those are alien cakes.

—RvP

VOICE OF EYE: **VESPERS**

On CD from Cyclotron Industries, PO Box 66291, Houston, TX 77266 (CYCI CD 222)

Waking, breathing, blooming, waning, melting, drifting, dreaming — it seems that Voice of Eye intends *Vespers* to be in the present and to be continuous. The folder shows a naked person seen from behind, crouching on a stone at the edge of a lake, standing upright on a hill top with his eyes fixed on majestic mountains across a valley, and apparently venerating the sun in desert surroundings. These pictures are set over a background of what looks like a processed photograph of ripples on the beach at ebb tide, but could also be a vast stretch of Arabic sand dunes caught with a satellite camera. One of the pictures inside is a mirrored image of cracked dry mud, taking on the aspect of two ceremonial masks right in the middle.

This imagery is consistent with the music of this duo, Bonnie McNairn and Jim Wilson. It is a product of serious sound warpage. No sounds were put together electronically. Apart from regular instruments (such as flute, guitar, bass, percussion and voice), they used sitar and shanai and self-built bass things, *jeemna* and *tape machine thing* — leaving the curious listener in the dark as to what on earth these devices may be and do. As far as I can make out, their reason for taking all this trouble is to create sonic environments that are unearthly and yet acoustic. However much the sounds may have been altered, there is still an audible trace of their organic origin as if they be spirits of old earth.

The tracks, each blending into the next, unfold an abundance of long sustained, harmonic chords, of sweet drones and hums, of tones sliding up and down at leisure, of wispy choruses over thudding, darkly scratching and tugging percussion; in short, a dreamy mood. What I find lacking, is a quality that dreams (mine, at least) may have — a weird sense of the inappropriate, verging on the comical. I mean, I had this dream once, in which I was among a crowd on stands beside a racing track; everyone and everything looking like cheap computer graphics, no shading or even the slightest attempt at more than two dimensions. First and last thing to cross the scene from right to left and back again, was a giant caterpillar running with its round, mask-like face swaying, smiling mischievously and emitting side-splitting creaky peals of laughter. But then I am not easily given to veneration, so neither are my dreams, I guess.

—RvP

Augustus Stroh And The Famous Stroh Violin: APPENDICES

by Cary Clements

Due to space limitations in our last issue, we delayed the appearance of several appendices for that issue's article "Augustus Stroh and the Famous Stroh Violin," by Cary Clements. Here now are those appendices, including a Stroh bibliograhy, a listing of patents held by Augustus Stroh, and a listing of museums having Stroh Violins in their collections.

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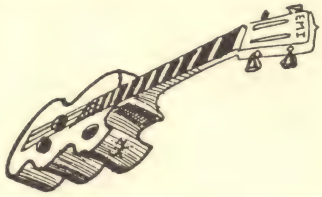
MUSEUMS WITH STROH VIOLINS IN THEIR COLLECTIONS

Science Museum	London, England
Welsh Folk Museum	Cardiff, Wales
Smithsonian Institution	Washington DC
Shrine to Music Museum	Vermillion, South Dakota
Museum of Fine Arts	Boston, Mass
Kolnischen Stadtmuseums	Cologne, Germany
Museu de la Musica	Barcelona, Spain
Edison National Historic Site	West Orange, New Jersey
Roy Acuff Museum/Opryland USA	Nashville, Tennessee



BOOK REVIEWS

By Bart Hopkin

HUGO PINKSTERBOER: **THE CYMBAL BOOK**

Hal Leonard Publishing Corporation (7777 West Bluemound Rd, PO Box 13819, Milwaukee, WI) 1992. 212 pages, paper bound

In many respects cymbals hold a unique place among widely-used musical instruments. They are among the simplest, being but a single piece of metal, with no moving parts. But percussionists will tell you that cymbals are among the subtlest of instruments; that each cymbal, whether hand made or mass produced, has its own distinct personality; that the simple act of striking can take on a surprising depth of sensitivity. And then there is the famous "family secrets" business — but we'll get to that in a moment.

The Dutch author Hugo Pinksterboer, clearly motivated by a love of his subject, has written this big, everything-you-always-wanted-to-know book about cymbals. It's a large-format paperback, attractive in layout, with lots and lots of black and white photos plus sixteen pages of color. The text ranges over cymbal history, acoustics, manufacture, care, and playing technique. The style is conversational and accessible.

Several aspects of *The Cymbal Book* are worth noting from an *EMI* sort of perspective. The historical sections touch upon several developments in the evolution not only of cymbals specifically, but of the drummer's kit in general. These are interesting from a purely musico-mechanical point of view (as in references to specific musical devices and how they worked). But equally enlightening will be the sense these episodes provide of the give and take between newly developing musical devices, the needs and desires of players, and evolving musical styles.

The sections on manufacturing processes also will be intriguing to *EMI* readers. Cymbal making is steeped in tradition. Modern manufacturing techniques including robotics and computer control are increasingly used, yet some manufacturers remain highly traditional, and all of them treasure and try to retain some of the spirit of the old ways. The book's author seems to have done a good job of investigating these things, visiting the major cymbal factories in Europe and the USA, speaking with workers, designers and management, and photographing wherever he was allowed. Especially with the older techniques, the cymbal-making process is a dramatic one, with disks of brass being fired in great, sooty, smoky ovens, and Pinksterboer comes away with some impressive photos.

The Cymbal Book's sections devoted to acoustics are in some ways frustrating. This is may in part reflect weakness in the writing, or in the author's grasp of the material (some of the terminology, for instance, is not well defined or deviates from standard usage). But it also reflects the nature of the subject matter. Pinksterboer, appropriately, approaches the topic primarily from a practical point of view: what factors affect the sound? But cymbals represent extraordinarily, complex, subtle vibrating systems, with countless factors at play, interacting in unpredictable ways. Anything one might say on the subject requires all sorts of qualifications, subsidiary explanations, consideration of additional variables, etc. Still, Pinksterboer manages to highlight salient factors in cymbal design, and to discuss, as well as circumstances allow, their acoustic effects.

The cymbals used in contemporary jazz and rock derive from a Turkish manufacturing tradition. The most highly regarded are made by a handful of companies which trace their history through family lines back to a single Turkish maker from the early 17th century. (Those companies bear the names Zildjian and Sabian, with Zildjian actually representing a couple of different operations at different times and places.) There is some folklore, not unlike that surrounding Stradivarius and the mysterious violin varnishes, regarding the manufacturing processes that the original maker employed. This is the famous secret, passed down orally and in strictest confidence from generation to generation within the Zildjian family. Pinksterboer represents that it's not just a myth; there really is a secret, and that it has something to do with the way in which the brass alloy for the cymbals is mixed. It's tempting to treat it all as some sort of magical alchemy; but who knows, maybe the secret is something terribly prosaic. Or maybe there's nothing of substance there at all, and it's pure silliness perpetrated on a gullible cymbal-buying public. Certainly there are other makers, not in possession of the secret, who have made good cymbals. Yet it is true that an awful lot of people regard cymbals bearing the Sabian or Zildjian names as best.

I can't resist mentioning how this "family secrets" business stands at odds with what *EMI* has been about from the start. *EMI* has managed to serve its purpose and make itself valuable to a lot of people precisely because individuals who had learned a bit from instrument making derived more pleasure from sharing their knowledge and seeing others make use of it than they did from jealous ownership.

Along related lines: people interested in making their own cymbals who read the Pinksterboer book will find much of it discouraging, in that many of the processes described could not very well be done on a hobbyist's scale in a home workshop. Yet he also discusses cymbals which are not individually cast, but cut from sheet metal and cold-hammered — processes which are much more do-able without requiring a large operation or special equipment. I myself have never made anything closely resembling a commercial cymbal, but I have fooled around with sheet metals in related applications. I've learned that although it might not be possible for a casual do-it-yourselfer to replicate the finest cymbals in the Turkish tradition, it's really not so impossible to create satisfying cymbal-like sounds even if your name isn't Zildjian. One key I found is to use moderately thin sheets of very hard metals, like stainless steel. For the sake of simplicity, suspend them, gong-like, from the edges; add some rivets or equivalent set loosely in holes to add some sizzle; experiment with different sorts of beaters; have fun.

To sum up and close (getting back to the book at hand), Hugo Pinksterboer's *The Cymbal Book* is an enjoyable book on a most interesting topic; it's full of information, most of which seems well grounded, and much of which would be hard to find elsewhere.

NOTICES

CALL FOR PAPERS: The American Musical Instrument Society will hold its 25th annual meeting at the Shrine to Music Museum, University of South Dakota, Vermillion, May 16-19 1996. Papers exploring important themes in current musical-instrument scholarship will be presented. Proposals for papers should be received by November 15, 1995. For information, contact John Koster at The Shrine to Music Museum, 414 East Clark St., Vermillion, SD 57069. [11-1]

Multi-instrumentalist/composer MARK WHITECAGE offers "Watching Paint Dry" cassette featuring his sound sculptures, horns, compositions with Rozanne Levine, Joe Fonda, Mario Pavone, Gerry Hemingway. $12.00 includes postage, check/m.o. payable to "Mark Whitecage" c/o Acoustics, 406 Washington St., Hoboken, NJ 07030, tel/fax (201)798-2166. [11-1]

BROADCASTATIC WVCW 640 AM / 105.3 Continental Cable FM: Experimental music radio show featuring lo-fi, free improv, electronic, and other sound experimentation. Please mail contributions to: TOMMY / PO Box 7222 / Richmond, VA 23221. [11-1]

Among the casualties of the Kobe earthquake was XEBEC, a sound showroom which had since 1989 presented concerts and installations by sound artists from Japan and around the world. For XEBEC to continue in a new or rebuilt venue, it will require support both locally and from abroad. If you can help financially or otherwise, contact Nobuhisa Shimoda, 5-2 # B-307, Kashinodai, Nishi-ku, Kobe, 651-22 Japan, or fax 81 78-992-8460 (att. B-307 Shimoda). 10-4]

Earthshaking Percussion: Djembe, Talking Drums, Didjeridu, Dumbeks, Typan, Frame Drums, Surdo, Pandiero, Tabla, Cajons, Clave, Angklung, Balafons, Clay Pot Drums, Kanjira, Bodhran, Sitar, Harmonium, Shekere, Slit Drums, Caxixi and much more. Call (404) 624-3e349 for free catalog & color photos! [10-4]

I make a variety of unprecedented electric kalimbas, paperback sized, solid-body bass rumba boxes, Indonesian pentatonic phase pulsars, and the amazing "Graphic Buzzalizer," that turns anyone into Jimi Hendrix! Info & prices — Generalissimo Kalimba, 535 SE 70th, Portland, OR 97215. 10-4]

The Just Intonation Network has opened a site on the World Wide Web. The URL (Universal Resource Locator) is http://www.dnai.com~jinetwk. The first version of the JIN web site includes introductory literature on just intonation and the network, a catalog for the Just Intonation "Store," index of articles from the network's journal **1/1**, and the introductory chapter from *The Just Intonation Primer,*. by David Doty. 10-4]

Lincoln Center Out-of-Doors presents a one-day festival of Musical Inventions: Performances, workshops and installations. Sunday, August 13th, 1995 at Lincoln Center, Lincoln Center Plaza, New York City. Lots of great sound artists. For information call (212)875-5151

Build a custom MIDI Controller/Instrument in one night! — PAVO introduces the MIDItools Custom Instrument Kit, allowing you to create a one-of-a-kind MIDI controller. More information: PAVO, 10 S. Front St., Philadelphia, PA 19106, USA; (215) 413-2355. 10-4]

Having made their living solely on the performance of their multimedia concerts, installations and lecture/demonstrations for the past eleven years as The McLean Mix, Barton and Priscilla McLean are announcing for the first time a tour bringing them to all parts of the continental USA during the winter-spring 1996 season with a choice of 17 different programs. Call Barton at (518) 658-3595 for info. 10-4]

Incantors — Q.R. Ghazala has recently bought out another small inventory of brand new and increasingly rare Texas Instrument Speak & Maths. These devices are the heart of the most deluxe and best sounding incantors to date. Price is $240 (reflecting only parts plus bench fee at repair shop hourly rates). Finished instruments are fluorescent green and gold. Controls include looping, speed/pitch dial, milk glass and brass electric eye (sequences loops with a wave of the hand), body-contacts for inter-flesh modulation, envelope LED, three voice-bending switches and reset switch. All incantors include blue fluorescent alpha-numeric display, monitor speaker, line output, custom patch cord, and instruction sheet. Amazement guaranteed. Owners consider the INCANTOR to be the ultimate experimental music box. For more information, see the INCANTORS article in EMI Vol VIII #6, June 1993, or write to Reed at Sound Theater, Echo 241, 7672 Montgomery Rd., Cincinnati, OH 45236, USA. 10-3]

ANYONE CAN WHISTLE is a catalogue of musical discovery, featuring great gift ideas for every age and pocketbook — music boxes, wind chimes, drums, toys and hundreds of musical instruments from the mundane to the obscure. Call for a catalogue and request our free sampler compact disc featuring music from an array of unusual instruments, plus performer interviews. Or visit our retail store at 323 Wall St. in uptown Kingston, NY. Anyone Can Whistle, PO Box 4407, Kingston NY 12401; tel. 800-435-8863, fax 914-331-4475. 10-2]

ELSEWHERES: The electroacoustic music of Hal Rammel. A CD of new recordings on the electroacoustic sound palette, designed and built by Hal Rammel. Contact Penumbra Music, PO Box 282, Grafton WI 53204 USA. 10-2]

A new book by Bart Hopkin, editor of Experimental Musical Instruments, has just been published by Lark Books. **Making Simple Musical Instruments: A Melodious Collection of Strings, Winds, Drums & More** is a collection of plans for home-buildable musical instrument, ranging in difficulty from simple to moderate. The people at Lark books did a **wonderful** job with the graphic design, layout and printing for this book. The book is written for a general, non-specialist audience, and the approach is non-technical The instruments presented aren't so very far out: most of them, by design, relate closely to familiar instrument types and are playable as such. Yet even experienced experimenters will find some new ideas here. It's hardbound, with 144 big and very full pages, lots of color, beautiful photos & illustrations; price $24.95. Order from Experimental Musical Instruments, PO Box 784, Nicasio, CA 94946, USA, phone (415) 662-2182. 10-4]

AIR COLUMNS AND TONEHOLES: PRINCIPLES OF WIND INSTRUMENT DESIGN is a spiral-bound booklet containing the four articles on practical wind instrument acoustics by Bart Hopkin that appeared in EMI in 1992 and 1993. The articles have been much revised and improved, and there are several additional features included. Published by Tai Hei Shakuhachi; available for $12.50 (no additional postage required) from Tai Hei Shakuhachi, PO Box 294-C, Willits, CA 95490, or from EMI, Box 784, Nicasio, CA 94946. 9-4]

A REMINDER — Unclassified ads here in EMI's notices column are free to subscribers for up to 40 words; 40¢ per word thereafter. For others they are 40¢ per word, 15 word minimum, with a 20% discount on orders of four or more insertions of the same ad. On the other hand, you might be surprised at how affordable a display ad is in EMI: $60/half page, $40/quarter page, $25/1/8 page. Write or call for details: EMI PO Box 784, Nicasio, CA 94946; phone/fax 415/662-2182.

SUBSCRIPTIONS TO EMI: $24/yr for U.S.; $27/yr for Canada & Mexico; $34/yr overseas. California residents add 7.25% sales tax for a total of $25.74. Order from EMI, Box 784, Nicasio, CA 94946, USA. Visa/MC accepted.

EMI BACK ISSUES: Bound volume sets Vol 1 through Vol. 10: $17 per volume. Each volume set contains all of the issues of one volume year, photocopied and bound under one cover. The photocopies are a step down in quality from the original press runs, but they are readable still. The price includes postage for U.S., Canada & Mexico air, and overseas surface rate. For overseas air add 20%. In California add 7.25% sales tax. Order from EMI, PO Box 784, Nicasio, CA 94946, or write for a listing of back issues and their contents. Corresponding cassette tapes are available for later volumes; see information below.

CASSETTE TAPES FROM EMI: $8 per cassette for subscribers; $10.50 for non-subscribers. Prices include postage for air delivery in U.S., Canada and Mexico, or surface delivery overseas. In California add 7.25% sales tax. For overseas air add $20%. Each tape contains music of instruments that appeared in the newsletter during the corresponding volume year, comprising a full measure of odd, provocative, funny and beautiful music. Volumes VI, VII, VIII and 9 remain available. Earlier volumes are now sold out. Order from EMI, Box 784, Nicasio, CA 94946. Visa and Mastercard accepted.

MORE OF THE SAME, ONLY BETTER

10-year report from Bart Hopkin, editor

With this issue, *Experimental Musical Instruments* begins its eleventh year of publication. That is the same as saying we're ten years old, and this is our tenth anniversary issue. Imagine that — *Ten years!* Copies from the original press run of our funny-looking, 16-page first issue, *EMI* Volume I #1, June 1985, are collector's items now. Our charter subscribers — there were about forty of them — could tell you that we've come a long way since then. Yet the spirit is fundamentally the same. Our guiding purpose remains, now as then, to report on the great diversity of possible musical sound-making instruments, with an emphasis on the unusual, the ingenious and the inventive.

For anyone who might be interested in daily operations at corporate headquarters here in Nicasio, California, here are some notes on what's new at *Experimusical Mental Instruments* as we enter our second decade.

Starting with this issue we have altered our front cover layout, with different typefaces and a slightly cleaner, more spaceous design. The table of contents, which used to appear on the front, has now moved to the inner pages. We'll be sticking with our tradition of having a paragraph or two of text on the cover, telling a bit about the contents of the issue and, hopefully, piquing people's interest. You may also notice some changes in the inside page layouts. Aside from heralding the new decade, these developments in graphic style mostly reflect the fact that we got some new page design software and a truckload of new fonts to play around with.

Also starting with this issue, we have entered the age of plastic: *EMI* an now take credit cards, including MasterCard, Visa, and a few others. This will be a benefit particularly for overseas subscribers, as it will reduce the hassle and expense of foreign currency exchanges. When we first applied for a merchant's Visa account, the bank personnel were straightforward in telling us that they rarely approve such accounts for mail- and phone-order businesses like Experimental Musical Instruments, and that our small size and less-than-stellar balance sheet made approval all but impossible. Yet — surprise! — we got the approval! I was later told that one of the bank officers reviewing the application subscribes to *EMI*, and put in a good word for us. Our thanks to that helpful soul.

EMI is in the business of selling subscriptions, back issues, and our annual cassette tape. There has always been a certain temptation to add more items to this list — to develop *EMI* into a general resource for diverse items that would be of value to musical instruments people. But to get into the business of reselling would entail an awful lot of busy-work, and (one suspects) would not likely prove profitable, given the CEO's widely heralded lack of business acumen. However, we are now making available a couple of additional items that have been produced in-house. These include my recently-released book *Making Simple Musical Instruments* (published by Lark Books) and my *Air Columns and Toneholes* booklet (published by Tai Hei Shakuhachi). A few more items are in the works as well, including the big, comprehensive book to be titled *Principles of Musical Instrument Design*. So, while *EMI* is not about to become a real mail order catalog, we are broadening our offerings a bit.

Everybody's jumping on the internet now, and hanging out pages on the World Wide Web. People with big enthusiasm, some of them with dollar signs in their eyes, act as if there's suddenly a million more connections to be made, a million more potential customers in the world, and millions more dollars to be made through the expanding electronic network. Actually, all there is is a new way to chase the same number of connections, the same number of potential customers, the same amount of dollars. The internet is, however, an effective networking mechanism. This is especially true for an organization like Experimental Musical Instruments, which must reach a widely dispersed group of people with a particular set interests. And so, for those of you with internet access, *EMI* is working on establishing a home page on the World Wide Web. The web site will include information describing what *EMI* is about, listings of what we have available, a comprehensive subject index for back issues, ordering information, a resource list pointing to other points of interest on the internet, and a sample article or two or three taken from past issues of the magazine. Our web page project is designed in part as outreach — a way of letting more people know that *EMI* exists — and so will be of less value for those who are already subscribers. The articles may be condensed; they may have fewer pictures; those pictures will appear at screen resolutions lower than the printed page ... in short, you're better off with your subscription to the journal in print. On the other hand, some features, such as the past articles index, will be potentially valuable to subscribers as well as browsers.

Which brings me to the next topic: Indexing and access to specific articles. Several years ago, and another time a few years before that, I put together subject-matter indexes for the growing body of material that was appearing in the pages of *Experimental Musical Instruments*. These indexes were, I have to say, not very well done. We are now in the process of creating a new 10-year index, and the intention this time is to do a less hasty and more thorough job. The index will allow readers to look up a given topic, and find a listing of all *EMI* articles in which that topic is mentioned. Since we have kept all our back issues in print, it will then be possible for people to put their hands on the articles cited. But this leads to another consideration: *EMI*'s current system for making back issues available while very convenient in some ways, is unwieldy if you're seeking just one particular article. (See our back issues blurb in the notices section of this issue for details on ordering back issues.) In light of that, we are considering whether to set up a photocopy service for individual articles. Through this service, if you wanted a particular article, you could order that article alone, paying a flat rate plus a per-page fee. Sound like a good idea? It's just speculation right now, and may or may not come to pass.

Incidentally, the new 10-year index is a human endeavor, not the product of a computerized word-search indexing system. In the future we will be looking toward computer indexing. The two approaches — human indexing vs. computer indexing — each have their advantages and disadvantages.

For the past several years, the office manager here at *EMI* has been Jeannie Filson. Jeannie, regrettably, is no longer working here, as full-time work has called her elsewhere. Thanks, Jeannie, for keeping things going around here all those years. Our new office manager and assistant editor is Kim Johnson. Kim has a background in small business management, social science research, and marketting communications, as well as international public information experience. Back in the 1970s she worked in stage management, concert production and band management. Currently she is enrolled in a doctoral program in San Francisco.

Final word: *Experimental Musical Instruments* is entirely dependent on generous contributions from so many people. I'm not referring to monetary contributions; I'm speaking of effort and ideas: with negligible compensation, these people write articles for us; they take photographs, submit artwork, inundate us with good ideas, provide direction, guidance and technical assistance in a variety of ways, share resources ... and the list could go on. To all who have contributed something to *Experimental Musical Instruments* over the last ten years —

thanks.

So we begin a second decade for *Experimental Musical Instruments*: more of the same, only better!

RECENT ARTICLES, continued from back cover

The Bulletin of Primitive Technology Spring 1995:No.9 (PO Box 3226, Flagstaff, AZ 86003) has a special focus on musical instruments, including the following articles —

"The Fire Watchers", by Laurence Libin (curator of musical instruments at the Metropolitan Museum of Art): a short introduction for the feature articles that follow, with speculation about humankind's earliest musical impulses and implements that may have been used to realize them.

"The Stone", by Maria-Louise Sidoroff: notes on lithophones (stone chimes) in various forms.

"What Kind of Sound Does a Gourd Make? The Plant, the Process and the Possibilities", by Steve Watts: Brief instructions on gourd cultivation and preparation, followed by suggestions for several instrument types a gourder can make.

"Primitive Flutes out of Bone: A South American Indian Example", by Manuel Lizarralde: Instructions, including both general background information and specific procedures, for making a bone flute.

"Musical Instruments of Central California", by Norm Kidder: Descriptions of several instruments of native Californians, including clapper sticks, deer hoof rattles, musical bow, and elderberry wood flutes and whistles.

"California Elderwood Flute", by Paul Douglas Campbell: fuller instructions for flute making.

"Making a Drum", by Robin Brown: The author describes how he made a drum from hollowed log, groundhog skin and cord made from the inner bark of basswood.

"How to Construct a Courting Flute or Flageolot" by Randal Kinkade: Instructions, with lots of photos and diagrams, for making a fipple flute similar to a Chippewa courting flute.

"Shell Trumpets", by Steve Watts: it takes but one paragraph here to describe the making of a conch trumpet.

"Ziarian Pop Shaker": a one-page diagram showing the anatomy of a bottle cap sistrum.

CAS Journal Vol. 2 No.7 (Series II) May 1995 (112 Essex Ave., Montclair, NJ 07042) contains articles on violin construction and acoustics, including "A Practical Approach to the Choice of Tonewood for the Instruments of the Violin Family" by Hajo G. Meyer; "A Brief Summary of A.H. Benade's Wind Instrument Adjustment Principles" by Peter J.Hoejke; and several more.

American Lutherie #41, Spring 1995 (8222 South Park Ave., Tacoma, WA 98408-5226) contains a range of articles on string instrument making, including —

"The Guitar Family, Continued" by Graham Caldersmith: information on a family of guitars (treble, standard classical, baritone and bass), including notes on design and construction.

"A Practical Approach to Hammered Dulcimers" by John Calkin and "Hammered Dulcimer Plan" by Debbie Suran and Nicholas Von Robison: two pieces on hammered dulcimer design and construction.

"Félix Manzanero and his Collection of Antique Guitars", by Ronald Louis Fernández: a photographic sampling of this collection of beautiful and unusual guitars.

And in **American Lutherie** #42, Summer 1995 (address above): Articles on resonance tuning for guitar soundboards, temperate zone woods for guitar making, musical instrument collections in American museums (wonderful photos), and many more topics.

The Galpin Society Journal XLVIII, March 1995 (7 Percival Ave., London NW3 4PY England) contains about a dozen articles on early European instruments, including —

"Some Recent Archaeo-organological Finds in Germany", by Dietrich Hakelberg: Notes on a 13th-century recorder recovered from the bottom of a latrine in Göttingen, and another excavated from the site of a hospital in Lübeck. Thoughts on the importance of the field of archeo-organology, meaning the study of early instruments recovered through excavation, are appended.

"Adam Beyer, Piano Maker", by Michael Cole: A report on the instruments of this relatively uncelebrated maker. Beyer incorporated a number of unusual pedals and stops as expressive devices into his instruments.

"The Balalaika — a Reappraisal", by Martin Kiszko: A history of the balalaika and related instruments.

"Pluck No. 6, May 1995, contains reviews of diverse types of jaw harps from around the world, most of them commercially available for purchase.

Woodwind Quarterly #8, February 1995 (1513 Old CC Rd., Colville, WA 99114 USA) contains a range of articles on woodwind making, including —

"The Sax, an Inside Story" by Jim Gebler: a discussion of the goings-on within the bore of a saxophone, and the implications for playability of slight variations in bore shape.

"Making a Pendant Ocarina", by Scott Hirsch: Clear and complete instructions, with lots of diagrams and photographs, for making a tiny 4-hole ocarina.

Lark in the Morning (PO Box 1176, Mendocino, CA 95460), a music store specializing in unusual instruments, has released its 1995 catalog, and, as in previous years, it is full of valuable information. Lots and lots of photos of diverse instrument types, with short informational articles along with the expected blurbs about items for sale.

RECENT ARTICLES IN OTHER PERIODICALS

The following is a selected list of articles relating to musical instruments which have appeared recently in other publications.

"The Development of Musical Glasses Prior to the 18th Century" by Lynn Drye, in **Glass Music World**, Spring 1995 (2503 Logan Dr., Loveland, CO 80538 USA).

This is the first installment in a multi-part article on water-tuned vessels. The focus is on early glass or ceramic bowls played with sticks in various parts of Asia.

"Rebirth of the Glass Harmonica" by Gerhard Finkenbeiner, also in **Glass Music World** Spring 1995 (address above).

The leading contemporary commercial maker of glass harmonicas looks back on the beginnings of his enterprise. He also discusses the relative merits of different types of glass for use in glass harmonicas.

"Color-Thermal Associations in Music" by Levon A. Grigoryan, in **Leonardo** Volume 28 #1, 1995 (MIT Press Journals, 55 Hayward St., Cambridge, MA 02142-9902, USA).

The author describes his work in seeking associations between audible tone and visual color. Among his conclusions: that particular colors are more dependably associated with particular interval relationships or musical modes than they are with specific pitches or keys (this contrasts with most earlier color-tone mappings, in which certain colors have been associated with certain pitches.

"The ANS Synthesizer: Composing on a Photoelectric Instrument" by Stanislav Kreichi, also in **Leonardo** Vol. 28 #1 (address above).

A report on an early photo-electric musical instrument created in Russia in 1958 by Eugene Murzin and a team of engineers. The sound is generated by an intermittently interrupted light beam shining on photo-electric cells, with the resulting patterns of alternating current sent to an amplifier and speakers. One of the interrupters is a continuously rotating transparent disk overlaid with patterns of opaque ink; the other is a clever method of scoring, which allows a composer to determine on which part of the disk light falls, when and for how long.

"Audio Jackets and other Electroacoustic Clothes" by Benoît Maubrey, in **Leonardo** Vol. 28 #2, 1995 (address above).

An artist describes his performance pieces in which performers wear clothes with speakers, amps, etc., built in.

"The Return of the Glass Armonica", an interview with Dennis James in **Continuo** Volume 19 #2, June 1995 (PO Box 327, Hammondsport, NY 14840).

Dennis James, a leading performer on glass armonica as well as several other once-popular instruments, talks about the Franklin Glass Armonica and its social history, as well as his own unusual performing career.

"'Logos Works' een Gloednieuwe Logos CD'" with commentaries by Douglas Quin and Larry Wendt, in **Logos-Blad** 17 #4, 1995 (Kongostraat 35,9000 Gent, Belgium).

Godfried-Willem Raes and Moniek Darge of the Logos Foundation in Gent have recently released a CD. In announcing it in the Logos Foundation newsletter they have brought in commentaries (in English, in this otherwise mostly Dutch periodical) by two American writers. The commentaries contain a great deal of information on these two extraordinary sound explorers and the organization that they founded.

"The Bowed Piano Ensemble" by Stephen Scott, in Logos-Blad 17 #6, 1995 (address above).

Notes in Dutch from the founder of the Bowed Piano Ensemble, a group that performs on piano insides with various sorts of bows.

"Vic Firth's Amazing Juggling Act" and "The Fine Points of a Guitar Slide" (no authors credited) in **The Music Trades**, June 1995 (PO Box 432, Englewood, NJ 07631).

Two articles on musical instrument accessories manufacturing: one on percussion mallets made by the Vic Firth company, and one on slides for playing slide guitar.

"La Calypsociation et Cetera" by Emmanuel Masselot, and "Du Simandre at de la Crecelle" by Eric Sutter, in **Percussions** No. 38, Jan/Feb 1995 (18, rue Theodore-Rousseau, F-77930 Chailly-en-Bierre, France)

Reports on steel drum (with several resource lists) and an ancient idiophonic percussion instrument called, in French, *Simandre*. Both articles in French.

And in **Percussions** No 39, March/April 1995 (address above), two more articles: "Fabriquer un Cajón" by Michel Faligand — Instructions for making and playing the hand-played Cuban wooden box drum; and "Des Tambours-a-Fente au Vanuatu", by Peter Russel Crowe — percussion instruments of Polynesia, Melanesia and Micronesia. Both articles in French.

"St. John Serendipity: Travels with the Gravikord" by Pip Klein and Bob Grawi, in **Folk Harp Journal** #87, Spring 1994 (4718 Maychelle Dr., Anaheim CA 92807-3040 USA).

Bob Grawi, maker of the kora-like instrument called the Gravikord, joined by performing partner Pip Klein, describe Caribbean travels with their unique instrument.

"Stringband Evaluation (Part Two)" By Joseph Jourdain, also in Folk Harp Journal #87 (address above).

This is the second of two articles on string scaling (determining appropriate string lengths, diameters, materials and overwindings) for harps. Included in this article are important charts listing physical characteristics of common stringing materials.

"Gourding in France" by Florence Haiber, in **The Gourd** Volume 25 #2, Spring 1995 (PO Box 274, Mt. Gilead, OH 43338-0274).

An American gourd lover describes her visit with gourd growers and crafters in France. Gourd instrument maker and collector Christopher Tree and his instruments figure prominently in the article and accompanying photos. Later in the same issue: a photo of T.N. Garland, James Garland and Minnie Black with gourd dulcimers, illustrating an article about the folk song "Sugar in the Gourd."

(Continued on page 43)